

Biggs-West Gridley Water District Gray Lodge Wildlife Area Water Supply Project



Giant Garter Snake (*Thamnophis gigas*) Habitat and Impact Assessment

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EXECUTIVE SUMMARY

Contingent upon final design, the programmatic Biological Opinion on Conveyance of Refuge Water Supply Project, West and East Sacramento Valley, California (Opinion) authorizes take of the threatened giant garter snake (*Thamnophis gigas*) in the form of permanent and temporary impacts resulting from the improvement of water delivery infrastructure. This report provides the information that the Bureau of Reclamation must provide in order for the U.S. Fish and Wildlife Service to append the construction of conveyance features to deliver water to Gray Lodge Wildlife Area (Proposed Action) to the Opinion.

In conformance with the Opinion's Implementing Procedure, this report provides an overlay depicting land cover with respect to the footprint of the Proposed Action, information on the number of acres of habitat to be temporarily and permanently impacted for each habitat type, and a project description, including details related to the types of disturbance and project timing. Impact minimization is thoroughly described and will be accomplished through strict adherence to the Incidental Take Statement provided in the Opinion and through applying supplemental measures designed to avoid and minimize impacts during the snake's inactive winter season. The non-discretionary items included in the Opinion's Incidental Take Statement, proposed supplemental measures, and a proposed option for compensating permanent habitat loss are included.

In addition to the items set forth in the Implementing Procedure, this report also provides a detailed assessment of habitat characteristics in the Proposed Action alignment. Following a field review conducted in 2009, CH2MHILL recommended that a Service-approved biologist conduct a more in-depth field survey to identify and classify areas of giant garter snake habitat in the project area¹. The completed assessment provides a detailed record of current site conditions, which can in turn be used to place the gross impacts associated with the Proposed Action in context with habitat character and suitability.

¹ CH2MHILL. 2009. East Sacramento Valley Study Area (Gray Lodge Wildlife Area) Summary Evaluation of Environmental Documentation and Permit/Approval Needs. Final Technical Memorandum prepared for U.S. Bureau of Reclamation. June 22, 2009.

The Proposed Action includes 69 minor structural modifications (disturbing less than 0.5 acre of land each), and 25 major structural modifications (disturbing over 0.5 acre of land each). The minor modifications consist primarily of concrete structure work including siphon, bridge, flume, weir, check, and head gate replacements and improvements. The major modifications consist primarily of canal work involving raising, reshaping, or widening either one or both canal banks, depending on the engineering requirements.

Project construction would result in both temporary and permanent changes to upland and aquatic GGS habitats. The Proposed Action would result in a net permanent loss of 1.15 acres of GGS habitat (a loss of 1.32 acres of aquatic habitat, and a gain of 0.17 acres of upland habitat, once re-establishment occurs). It would also result in the temporary loss of a total of 48.22 acres of GGS habitat (24.31 acres of aquatic habitat and 23.91 acres of upland habitat).

The Opinion and subsequent memoranda stipulate that total permanent impacts shall not exceed 22 acres and that permanent habitat loss shall be compensated at a 3:1 ratio. All aquatic and upland compensation areas provided for the giant garter snake shall be protected in perpetuity by a Service-approved conservation easement which shall be recorded at the county recording office prior to any ground breaking for major modifications. The minor structural modifications may proceed prior to recordation of a conservation easement, but the entire preservation acreage for compensation of all minor and major structural modifications must be in place prior to any ground breaking associated with any of the major structural modifications. The easement/deed shall be provided to the Service within 30 days after recordation.

Compensation requirements for impacts resulting from the Proposed Action can be met through Westervelt Ecological Service's Sutter Basin Conservation Bank. Situated south of the Sutter Buttes, the 429-acre Sutter Basin Conservation Bank is located in Sutter County, ten miles south of Yuba City, and includes a service area encompassing the entirety of the Proposed Action. This managed marsh is approved by both the Service and California Department of Fish and Wildlife to provide giant garter snake mitigation credits, and currently has approximately 194 credits available for purchase.

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1. REGULATORY HISTORY AND GUIDELINES

In a letter dated and received by the Sacramento Fish and Wildlife Office (SFWO) on November 4, 1998, the Bureau of Reclamation (Reclamation) requested a formal consultation with the U.S. Fish and Wildlife Service (Service) on the Conveyance of Refuge Water Supply Project (Conveyance Project), West and East Sacramento Valley, California. This letter requested the Service to address effects on the giant garter snake that could result from structural modification of the East and West Sacramento conveyance facilities. On December 7, 1998, the Service rendered its biological opinion on the effects of the action on the giant garter snake (*Thamnophis gigas*), in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act).

The resulting 1999 Programmatic Opinion (Opinion) (Service file 1-1-99-F-0015) is based on information provided in: (1) the October 1998 Biological Assessment for Conveyance of Refuge Water Supply Project, West Sacramento Valley Study Area and East Sacramento Valley Study Area; (2) the December 1997 Environmental Assessment for Conveyance of Refuge Water Supply Project West Sacramento Valley Study Area (USBR); (3) the December 1997 Environmental Assessment for Conveyance of Refuge Water Supply Project East Sacramento Valley Study Area; (4) Project Description Amendment for RWS Biological Opinion (memo from Kathy Freas to Ellen Berryman, dated December 3, 1998); (5) field investigations, and other sources of information. A complete administrative record of this consultation is on file in the SFWO.

Background/Consultation History

The primary purpose of the Conveyance Project is to provide or upgrade facilities to accommodate Level 4 refuge water supply (defined below) as required under the Central Valley Project Improvement Act (CVPIA). Reclamation, in cooperation with the Service and the California Department of Fish and Game (Department), is responsible for implementing Section 3406 (d)(5) of the CVPIA, which requires that reliable Level 4 water supplies be delivered to the National Wildlife Refuges (NWRs) and state Wildlife Management Areas (WMAs) specifically included in the CVPIA. Two primary water supply levels, Level 2 and Level 4, have been identified under the CVPIA refuge water supply program. Level 2 water supplies are defined as existing average annual water deliveries, while Level 4 water supplies are defined as those quantities of water required for full habitat development for each of the refuge areas. The CVPIA requires Level 4 water supplies to be provided as firm, reliable, long-term entitlements for each of the refuges.

Because of capacity constraints and/or maintenance requirements in existing delivery systems, existing conveyance facilities need to be modified to provide Level 4 water supplies to Sacramento Valley Refuges. Currently, water supplies are conveyed on an as-available basis, which is not consistent with refuge needs. In most cases, existing facilities were not designed to convey peak refuge requirements in addition to existing agricultural demands, or are dewatered for maintenance purposes and, therefore, do not have year-round delivery capability. Facilities must be modified to support scheduled maximum Level 4 peak flows.

To provide Level 4 water supplies in compliance with the CVPIA, Reclamation must undertake a number of interrelated actions that will be addressed in separate biological opinions. The Conveyance Project consultation only addresses the effects of improvements to water conveyance facilities that are necessary to deliver Level 4 water to the refuge boundaries, and does not address potential effects to listed species that could result from: (1) use of that water on the refuges; (2) improvements to conveyance facilities on the refuge; or (3) potential effects of water acquisition for the program. The effects of taking water from the source where the water is acquired for refuges is being addressed in the programmatic biological opinion for the CVPIA. Additionally, refuge activities that are expected to result from the availability of additional refuge water supply are to be addressed in separate biological opinions on refuge long-term maintenance and operations and refuge conveyance facilities.

In support of the Programmatic Consultation, surveys of the project area were conducted during the fall of 1995 and 1996 to determine whether the project may affect any federally listed or proposed species. A special focus was given to searching for habitats that might support federally listed or proposed species which are known to occur in the vicinity, including the giant garter snake, the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), palmate-bracted bird's beak (*Cordylanthus palmatus*), and vernal pool species such as vernal pool fairy shrimp (*Branchinecta lynchii*), vernal pool tadpole shrimp (*Lepidurus packardii*), Hoover's spurge (*Chamaesyce hooveri*), hairy Orcutt grass (*Orcuttia pilosa*), Colusa grass (*Neostaphia clusana*), and Greene's tuctoria (*Tuctoria greenei*).

No elderberry bushes were found in the area to be impacted by the structural modifications, therefore it was determined that the Conveyance Project is not likely to affect the valley elderberry longhorn beetle. Similarly, vernal pool species are not expected to be affected by the project because no vernal pool habitat was found in the impact area. Habitat for palmate-bracted bird's beak (valley sink scrub and alkali

meadow) is not present in the impact area, hence this species is not expected to be affected by the project.

The Sacramento splittail (*Apogonichthys macrolepidotus*) is known from the project area. This species was federally proposed for listing as threatened on January 6, 1994 (59 **FR** 862). Sacramento splittail occur in the Sutter Bypass, in the vicinity of a proposed siphon installation that would be necessary for water conveyance to Sutter NWR. However, the siphon would be installed just upstream of an existing weir that precludes passage of Sacramento splittail from this part of the bypass, so this species would not be affected by the siphon installation.

During meetings on September 3, September 22, and October 8, 1998, Ellen Berryman of the Service and Kathy Freas of CH2M Hill (representing Reclamation) developed a strategy for addressing the numerous activities to be authorized for take under the Opinion. The Conveyance Project involved 83 minor structural modifications along the Glenn-Colusa Irrigation District (GCID) Main Canal, disturbing less than 0.5 acre of land each, and 29 major structural modifications which generally disturb over 0.5 acre of land each. Only four of the 29 major structural modifications had been designed (at 50% design level); the locations and types of activities to be undertaken for the remaining 25 had been determined (see Appendix A) but no site-specific design had been completed. It was therefore determined that a programmatic approach should be used for these undesigned major modifications, such that: (1) the Opinion use gross impact estimates to generate "sideboards" for the maximum amount of total habitat to be disturbed for each structure; (2) more precise impact quantification be provided as designs are completed for each structure, and compared to the sideboard estimates to determine compliance with the biological opinion; (3) take be authorized, in the form of a letter appended to the programmatic opinion, for construction at each site once it has been confirmed that the construction would be consistent with the programmatic opinion.

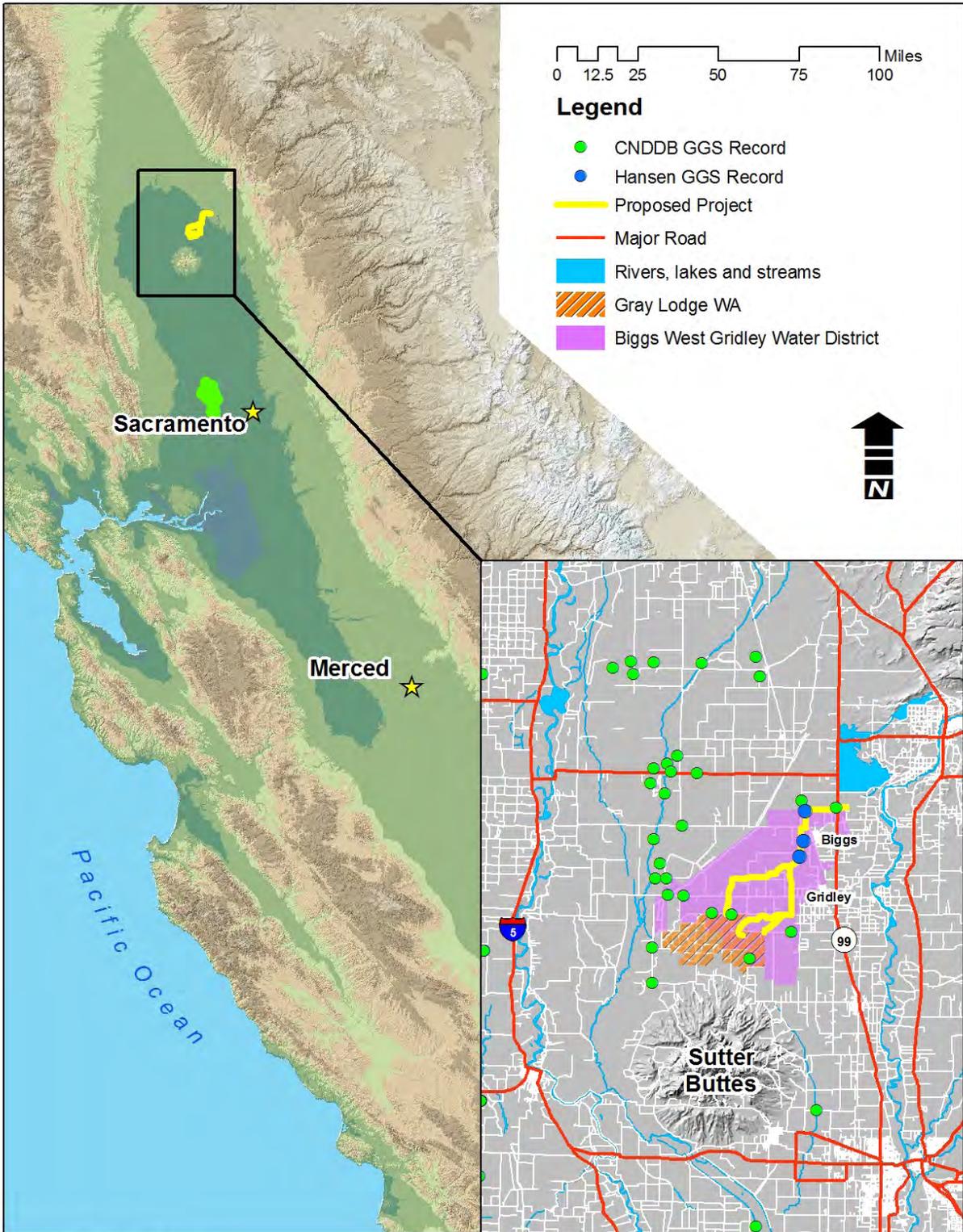
Proposed Action

On June 30, 2009, Reclamation requested that the Service append the construction of conveyance features to deliver water to Gray Lodge Wildlife Area (Proposed Action) to the Opinion. The Opinion authorized the incidental take of giant garter snakes in the form of up to 5.5 acres each of suitable aquatic and upland giant garter snake habitat. As indicated in Reclamation's request of June 30, 2009, the number of modifications to the water delivery system [was] expected to increase from 25 to 56, and the acreage affected by the construction [would] increase to 22 acres (11 acres of aquatic and 11 acres of upland). These habitats would either be temporarily or permanently disturbed during construction activities and would be mitigated in accordance with the Mitigation

Criteria/or Restoration and/or Replacement of Giant Garter Snake Habitat (Criteria) included in the Opinion.

The Service, in a separate memorandum (Memorandum) (Service file 81420-2009-TA-1164-1), concurred with appending the Proposed Action (Figure 1) to the Opinion because the work proposed at Gray Lodge is consistent with the parameters defined in the Opinion as long as the terms and conditions and compensation requirements contained in the Opinion are met. For take of giant garter snake to be authorized under the Opinion, the following criteria are required for each major structural modification:

1. Habitat loss will not exceed the amount specified within table 5 of the 1999 Programmatic Opinion or the 22 acres (11 acres of aquatic and 11 acres of upland) specified within the Service memorandum.
2. The total cumulative amount of permanent giant garter snake habitat loss for all projects listed in Appendix A of the Opinion has not exceeded 24.5 acres of upland habitat or 29.5 acres of aquatic habitat (the total acreage for all projects addressed by the Opinion).
3. The activity has been designed to minimize impacts to giant garter snakes and their habitat to the maximum extent practicable, through consultation between design engineers and a Service-approved biologist familiar with giant garter snake habitat needs.
4. The activity will comply with the terms and conditions of the Opinion.



Created on December 26, 2011

Sources: CaSIL, CNDDB 2011, EC Hansen

Figure 1: Project location and regional giant garter snake occurrence distribution

2. IMPLEMENTING PROCEDURE

The Service can authorize take for the Proposed Action only after these activities have been appended to the Opinion. The following procedure is required to authorize take for each of these proposed modifications, using a programmatic approach under the Opinion:

1. Reclamation will submit a letter requesting that the Proposed Action be appended to this Opinion and provide the Service with the following:
 - a. A project description, including details related to the types of disturbance, project timing, and a discussion as to how impacts are minimized to the maximum extent practicable relative to the Service's Standard Avoidance and Minimization Measures During Construction Activities in Giant Garter Snake Habitat.
 - b. Information on the number of acres of habitat to be temporarily and permanently impacted for each habitat type.
 - c. A 1"=20' site plan with an overlay showing habitat types at the site (open water, marsh, rice field, disturbed upland, etc.), and differentiating areas to be temporarily and permanently impacted.
2. The Service will review the information provided to determine whether the Proposed Action meets the criteria for being appended to the Opinion, or whether a separate biological opinion is necessary.
3. If the Service determines that the activity is appropriate for inclusion, the Service will provide a letter appending the activity to the Opinion.

In conformance with Section 1 of the Implementing Procedure, this report provides a description of the Proposed Action, including details relating to the types of disturbance and project timing, and quantifies the number of acres of habitat to be temporarily and permanently impacted for each habitat type. Impact minimization is thoroughly described and will be accomplished through strict adherence to the Incidental Take Statement provided in the Opinion. In addition, because the Proposed Action violates the condition that major modifications must be completed between May 1 and October 1 (the giant garter snake active season), supplemental avoidance and minimization measures are also proposed to reduce and/or eliminate the increased risk of direct

impacts associated with work conducted between October 2 and April 31 (the giant garter snake inactive season). The non-discretionary items included in the Opinion's Incidental Take Statement, the supplemental measures offsetting winter impacts, and a proposed option for compensating permanent habitat loss are included as part of this report. Based on direction provided by the Service and Reclamation in a meeting on December 6, 2011, a series of GIS-generated overlays depicting land cover with respect to the Proposed Action footprint is provided in lieu of a 1"=20' site plan due to the enormous number of plates that would be required at the 1"=20' scale.

3. BIGGS-WEST GRIDLEY GRAY LODGE WATER SUPPLY PROJECT DESCRIPTION

Proposed Action

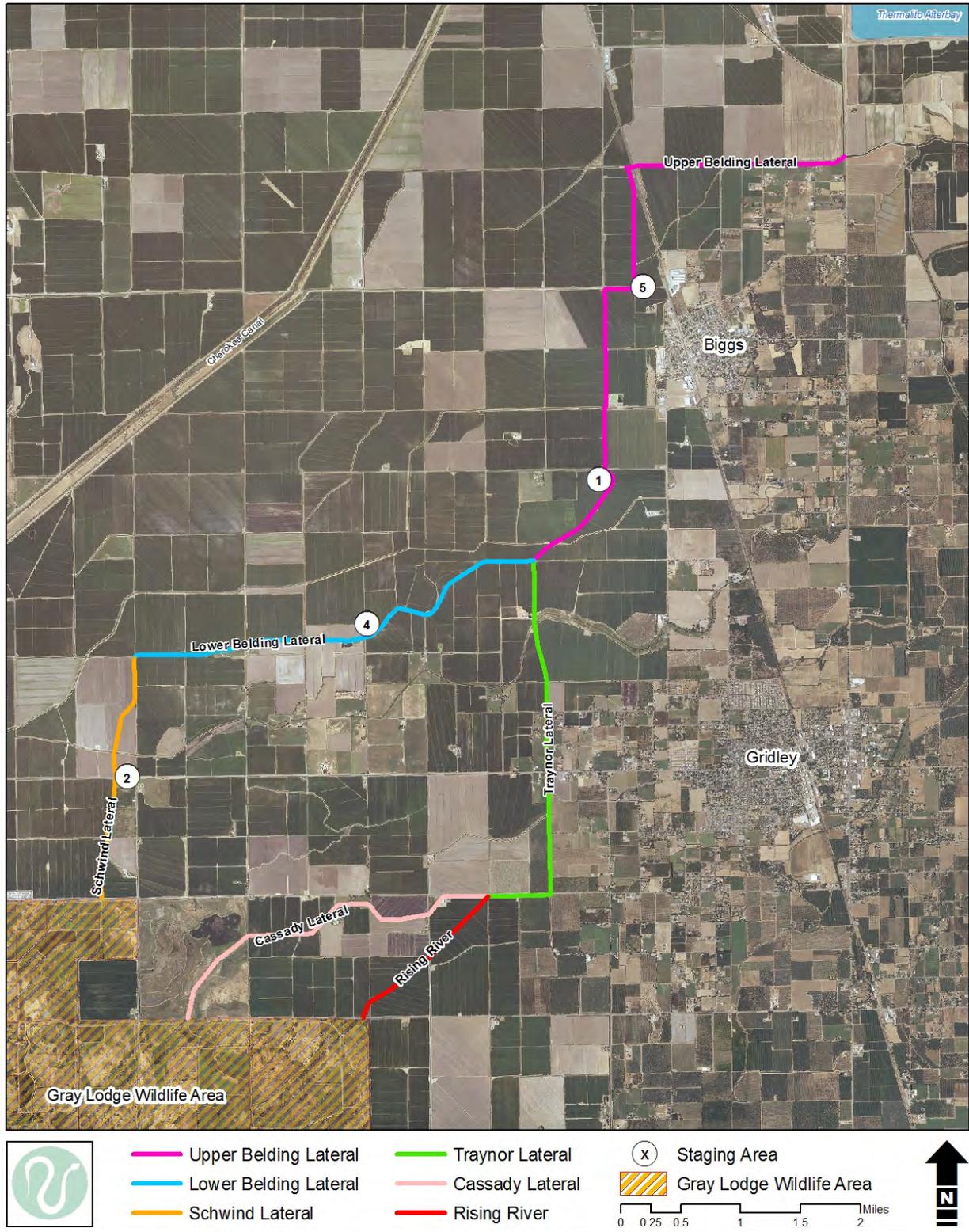
The Proposed Action involves the structural modification of portions of the Biggs-West Gridley Water District's (Water District) water conveyance facilities. The canal improvements would provide additional capacity required to deliver required water supplies into the Gray Lodge Wildlife Area. The Proposed Action would allow for firm, historic average annual water deliveries (Level 2) in addition to incremental amounts of water required for optimal wildlife management (Level 4) from the Central Valley Project (CVP) or State Water Project (SWP) facilities to the boundary of the Gray Lodge Wildlife Area refuge as required by the Central Valley Project Improvement Act.

The Proposed Action consists of improving or replacing minor structures along the canal, consisting of bridges, siphons, flumes, weirs, checks, and farm crossings. Improvement of the water conveyance facilities will be accomplished by retro-fitting or replacing these structures throughout the canal system, as well as modifying canal cross-sections to improve hydraulics. The canal system will be graded to "smooth" the channel to improve the hydraulics and portions will be widened to increase capacity.

The canal improvements will occur along the following laterals: Belding, Schwind, Traynor, Rising River, and Cassady (**Figure 2**). The proposed action comprises a linear corridor approximately 19.2 miles in length covering the length of all canals included in the project design and a 200 foot buffer on each side of canal center line.

The identified system improvements represent agreement between Reclamation and the Water District, reached in this stage of project development, regarding the improvements necessary to accomplish project objectives and mitigate project effects. As a part of engineering design, the operational role of each major structure has been

investigated cooperatively with the Water District to ensure that the specific structure type will achieve its desired function. These structure refinements will benefit the Gray Lodge Water Supply Project by enhancing the Water District's ability to run its system efficiently while reliably delivering full water supplies to the Gray Lodge Wildlife Area.



Created 28 December 2011

Sources: NAIP 2010

Figure 2: Project Improvement Locations and Potential Staging Areas

Description of Construction Activities

Construction activities will include the demolition of existing structures, excavation to accommodate new structures and channel improvements, cast-in-place concrete work, and earthwork to reshape canals so they meet design criteria. The Proposed Action includes 69 minor structural modifications (disturbing less than 0.5 acre of land each), and 25 major structural modifications (disturbing over 0.5 acre of land each). The minor modifications consist primarily of concrete structure work including siphon, bridge, flume, weir, check, and head gate replacements and improvements. The major modifications consist primarily of canal work involving raising, reshaping, or widening the canal banks, which will occur on either one or both sides of the canal depending on the engineering requirements.

Minor Modifications

Typical minor structural modifications will consist of structure excavation, demolition work, concrete placement, and structure backfill. It is anticipated that the following equipment will be used to complete this work: Cat 322 excavator; Cat 966 wheel loader; Cat 446 backhoe; end-dump truck; concrete mixer trucks; concrete pump truck; 30-ton hydraulic crane; Cat CP323 padded drum compactor; water truck; 2-ton flatbed truck; pickup trucks.

Check Structures/Long-Crested Weirs - The long crested weirs will be designed such that the concrete sill elevation is 1 foot below the design sill elevation. The top 1 foot will utilize flash boards which will allow the District operators to adjust the weir to the correct elevation. The majority of the flow conveyed through the structure will pass through the structure gates. Additionally, the check structures will be designed to pass the design flow over the weirs (while utilizing the available freeboard) in the event that the gate is closed.

Turnouts and Lateral Headgates - Landowner turnouts and lateral headgate structures are intended to be protected in place unless one of the following reasons warrants replacement.

- *Construction activities* - Due to canal widening, bank raising, and other construction activities, some turnouts may be removed and replaced.
- *Hydraulics* - If it is determined the hydraulic performance of the turnout or lateral headgate is unacceptable, then the structure will be removed and replaced.
- *Freeboard* - In some instances freeboard is currently an issue for both turnouts and headgates. Under the proposed design, lack of freeboard may necessitate

the removal or modification of these structures. If the freeboard is over 0.5 feet, then the headwall will be extended. If the freeboard is 0.5 feet or less, the structure will be removed and replaced.

Bridges/Crossings - A number of farm crossings and five county road bridges require replacement to accommodate the additional flows for the Project. Brief descriptions of the work proposed for the county road bridges and farm crossings are provided below.

- *County road bridges* will be designed as a cast-in-place concrete trapezoidal section. This will require the bridges to be built during the February to April shutdown. Butte County will require a temporary traffic bypass to be established at each site. The bypass should consist of a class II aggregate base course when outside of the paved roadway. The contractor will be allowed to bring traffic to a full stop before proceeding through the bypass. This will allow a lower design speed to be used for the bypass, thus reducing the work and land requirement. Butte County will also require the breakaway barriers and flares to be established at each side of the bridge. The flare may be “broken” to accommodate travel along the canal banks by District personnel.
- *Farm crossings* will consist of two types of structures. The first will be a precast bridge supported on driven precast concrete piles. This will allow the bridge to be built while water is flowing and take the farm bridge construction out of the critical path. The second type of structure will be a double pipe culvert crossing, with rip rap inlets and outlets. The culvert crossing will be used for flows less than 100 cfs. In either instance, guardrails will not be designed as it is expected growers will bring farm equipment and implements across the bridges which could overhang the deck and would damage the guardrail. This is currently the case with all of the farm bridges.

Union Pacific Rail Road Crossing - A new 96-inch pipe will be installed at the Union Pacific Rail Road (UPRR) crossing near the head of the Belding Lateral. Key design considerations include complying with UPRR requirements and minimizing the risk of settlement or heaving. The tunnel will be located on the north side of the existing crossings, and will join the canal through a split in the channel on either side of the railroad. This will allow the crossing and headwalls to be built during the irrigation season, taking this work out of the giant garter snake inactive season.

Flumes - Five flumes are proposed for the project, located at: Razorback and Garcia siphons, and the Fields, Nugent and Schwind flumes. The Razorback and Garcia siphons are proposed to be converted to flumes so that headloss through the crossing

can be reduced and vehicular access through the crossing is improved. The flume crossings are proposed as long-throated flumes consisting of reinforced concrete lining within a trapezoidal channel. For the Fields, Nugent and Schwind flumes the culverts will be designed to match the existing cross-sectional area plus the boarded area on the sides of the existing flumes. For the Razorback and Garcia flumes the culverts will be designed to match the cross-sectional area of the nearest upstream drain crossing.

Major Modifications

Typical canal excavation and embankment work will consist of shaving off the top of the levee on one side of the existing canal and dumping that fill into the existing drainage ditch at the outside foot of the levee. The inside bank of the levee would then be excavated to broaden the width of the existing canal. The excavated material would be placed on top of the levee, smoothed and compacted. For the entire length of the project, one drive bank would receive crushed rock or a similar type of all-weather surfacing material. An excavator would then dig a new drainage ditch at the outside foot of the reshaped levee and the excavated material would be placed on top of the adjacent levee, smoothed and compacted. The existing drainage ditch would be replaced approximately 4-10 feet farther away from the canal bank. In these locations, the intent is to maintain the existing slope and channel dimensions so that function of the drainage ditches is not altered. All work would be performed over the existing drainage ditch or from the top of the existing canal bank. Therefore, the limits of ground disturbance beyond the outer edge of the existing narrow drainage ditch will be no more than 20 feet. Maximum depth of excavation into native soil will be approximately four feet. It is anticipated the following equipment would be used to complete this work, and that multiple structures and improvement segments would likely be underway at any given time: Cat 322 excavator; side-dump trucks, end-dump truck, Cat 966 wheel loader, Cat 446 backhoe; Cat CP-323 padded drum compactor; Cat 120H motor grader; water truck, mechanics truck; pickup trucks. The general character, range of width, and length per reach are summarized in **Table 1**, below.

Table 1. General width increase by reach

Segment	Affected Area Length (Mi)	Increase in Width (Ft)	Adjacent Land Use
Upper Belding	5.60	5-25	Rice
Traynor	3.32	10-35	Rice, Orchard
Cassady	3.12	0-15	Rice, Pasture
Lower Belding	3.65	2-10	Rice
Schwind	2.06	3-8	Rice
Rising River	1.47	5-22	Rice, Marsh/Wetland

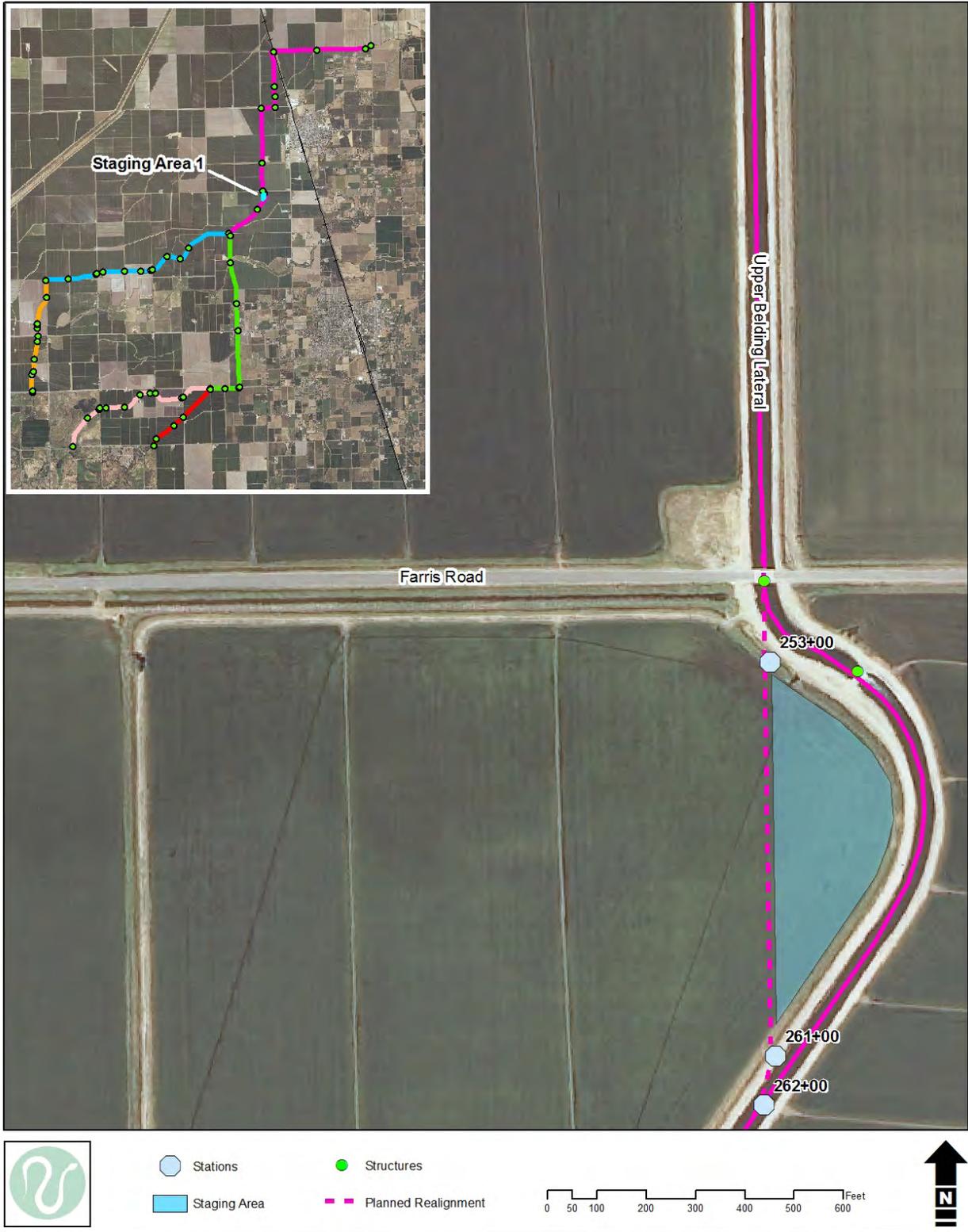
Canal velocities will remain consistent with those of conveyance systems supporting giant garter snakes throughout the Central Valley. Most canals will be designed so that the maximum velocity does not exceed 3.5 ft/s. However, because it is important to minimize water levels and canal sizes, some segments of the canal system may have design velocities that exceed 3.5 ft/s. Where velocity is expected to exceed 3.5 ft/s only for short periods of time during rare high-flow events, no additional design measures may be required. Calculated velocity for normal depth at maximum design flow rate will be allowed to be up to 4.0 ft/s for events that are expected to occur less than 1% of the time. Where velocity is expected to exceed 3.5 ft/s more than 1% of the time or will exceed 4.0 ft/s at the design flow condition, rock or gravel blankets may be used to armor the earth canal to prevent erosion. The maximum velocity criteria are summarized in **Table 2**, below.

Table 2. Velocity/Design Criteria

Maximum Velocity	Corresponding Flow Rate	Frequency of Occurrence	Canal Design
Up to 3.5 ft/s	Up to maximum design flow	Any amount	Earth
3.5 – 4.0 ft/s	Greater than 90% of maximum design flow	Less than 1% of time	Earth
3.5 – 4.0 ft/s	Less than 90% of maximum design flow	Greater than 1% of time	Earth armored with rock/gravel
4.0 – 4.5 ft/s	Up to maximum design flow	Any amount	Earth armored with rock/gravel

Potential Staging Areas

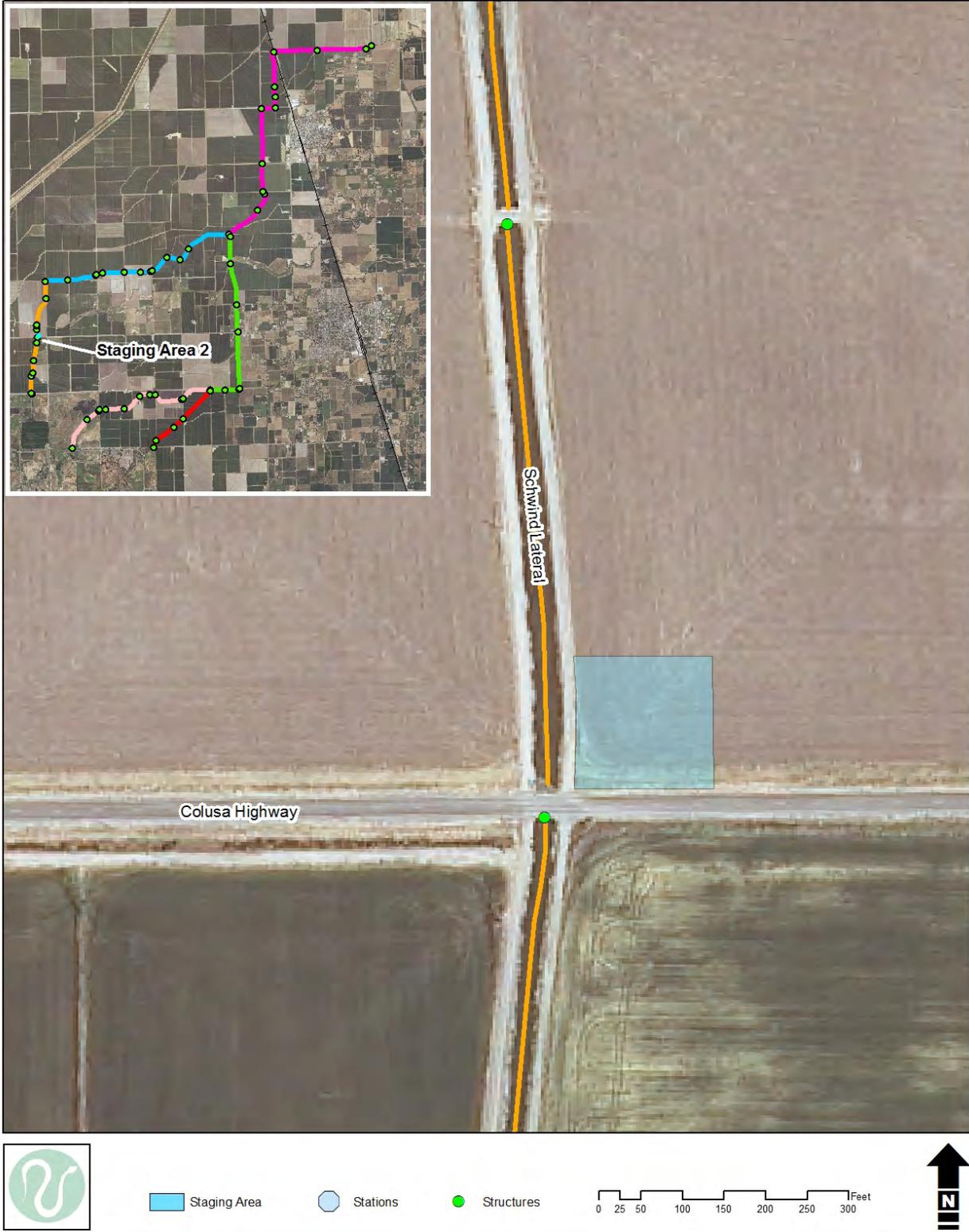
There are up to four (4) staging areas that have been identified for stockpiling and construction equipment. (A fifth potential staging site – originally referred to as Staging Area No. 3 – was eliminated from consideration due to the presence of wetlands.) Of these four, sites that will actually be used for construction will depend upon the routing alternative selected. As depicted on **Figure 2**, the staging areas are located near the Farris Road and Belding lateral intersection, Colusa Highway and Schwind lateral, Riley Road and Belding lateral, and Biggs Princeton/Afton Road and Belding lateral. Physical changes to farm fields would be done prior to farm operations starting in the spring of 2014. Details of the proposed staging area locations are provided in **Figures 3-6**.



Created 28 December 2011

Sources: NAIP 2010

Figure 3: Staging Area 1 detail



Created 28 December 2011

Sources: NAIP 2010

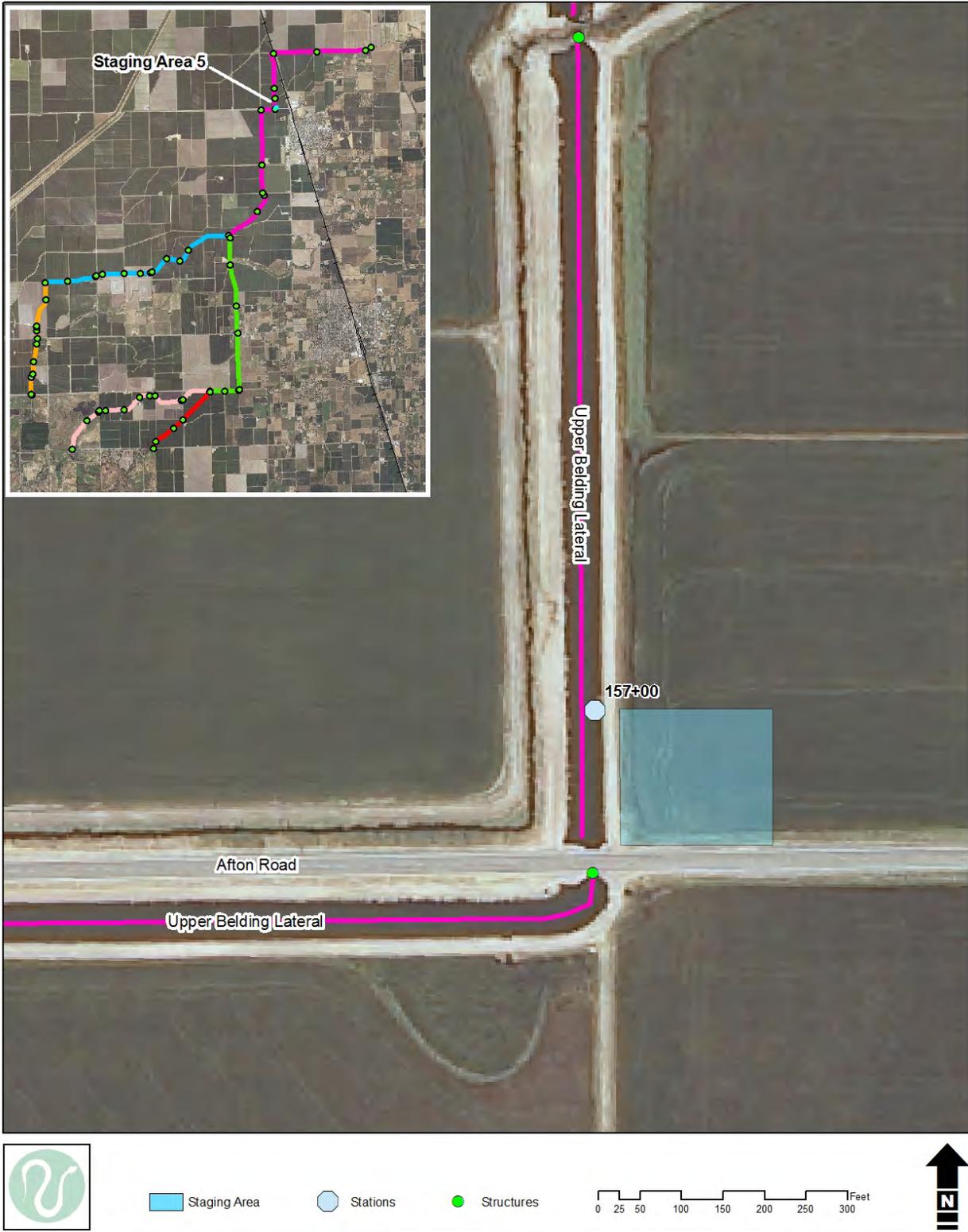
Figure 4: Staging Area 2 detail



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Sources: NAIP 2010

Figure 5: Staging Area 4 detail



Created 28 December 2011

Sources: NAIP 2010

Figure 6: Staging Area 5 detail

Timing of the Proposed Action

Slated to begin in the summer of 2013, construction sequencing and staging will be subject to constraints (limited dry periods, limited right-of-way, adjacent landowner facilities, permitting, etc.). The project is slated for completion around May 2015, providing two “dry” periods (generally the end of January to the middle of April each year) when the District’s system is dewatered and accessible for construction within the canal prism. The majority of construction work would be carried out during the months of February, March, and April when the canal system is dewatered, and will be completed over two construction periods in 2014 and 2015, but could extend into 2016 if weather or permitting constraints delay project work. There may be additional limitations on the timeframe for construction activities because precipitation can make earthwork difficult and require supplemental dewatering. The design will be developed to incorporate between three and five phases comprising multiple bidding schedules, structured as follows:

- Contract 1A – Upper Belding (Feb 2014 to Oct 2014): Begins at the head gate on Hwy 99 and continues downstream up to the Division 2 split. Most of the earthwork would be done during the irrigation season, while the structural work would be done during the winter shutdown (Feb to Apr 2014).
- Contract 1B – Flumes and County Bridges (Feb 2014 to Apr 2014): This contract includes the Nugent and Schwind Flumes, the Colusa Hwy. and W. Liberty Rd. bridges on the Traynor Lateral, the Farris Rd. bridge on the Lower Belding Lateral, and the RD833 crossings located adjacent to these bridges.
- Contract 2 – UPRR Crossing (July 2014 to Feb 2015): This contract would include the pipe crossing under the UPRR tracks and the transitions to the Upper Belding lateral on either side of the crossing. The timing of this contract will allow the crossing to be built when weather typically is not an issue and then to allow it to be tied back to the canal during the 2015 winter shutdown. This will take most of this task out of the critical winter shutdown months.
- Contract 3A – Traynor Lateral (Aug 2014 to June 2015): This contract would include the work on the Traynor Lateral from the Division 2 split to Gray Lodge. Most of the earthwork would be done during the irrigation season, while the structural work would be done during the winter shutdown (Feb to Apr 2015).
- Contract 3B – Lower Belding, Schwind and Cassady Laterals (Aug 2014 to June 2015): This contract would include the work on the Lower Belding, Schwind Laterals from the Division 2 split to Gray Lodge and the Cassady Lateral (or Gerst and Sheppard Laterals). Most of the earthwork would be done during the irrigation season, while the structural work would be done during the winter shutdown (Feb to Apr 2015).

It is acknowledged that the proposed construction schedule violates the terms and conditions of the Biological Opinion, which require that major modifications occur only between May 1 and October 1, which is when giant garter snakes are active and best able to avoid direct impacts. To avoid direct impacts associated with work conducted between October 2 and April 31 (the giant garter snake inactive season), the disturbance (scraping, grading, or otherwise preparing anticipated work areas so that overwintering habitat is eliminated) of all work areas for which winter work is anticipated is proposed for completion prior to September 15 of the year in which winter work is expected. Proposed measures are fully described in **SECTION 6: SUPPLEMENTAL AVOIDANCE AND MINIMIZATION MEASURES.**

4. HABITAT ASSESSMENT

In conformance with the recommendation that a Service-approved biologist conduct a more in-depth field survey to identify and classify areas of giant garter snake habitat in the project area, potential habitat was evaluated using a list of 22 variables associated with giant garter snakes to characterize features using GIS program ArcGIS Version 9.2, resulting in a database file depicting cumulative habitat scores for each feature. Reaches within the entirety of the Proposed Action alignment have been projected as linear features on maps and classified according to cumulative habitat score to show suitability for giant garter snakes. For this analysis, habitat evaluation criteria were based on recognized minimum ecological requirements for giant garter snakes (see **Appendix A and Appendix B**). Each criterion was scored, with a final numerical total represented categorically using Geographic Information Systems (GIS). All results were then confirmed with a visual assessment of habitat. This evaluation provides a series of GIS-generated maps illustrating habitat value by colored code, supporting a detailed classification, by trait, of habitat variables within the Proposed Action alignment. Representative photographs of all project features are provided in **Appendix C**.

Assessment Methods

Scoring methodologies are modified from the USFWS 1999 Draft Recovery Plan for the Giant Garter Snake (Appendix D: Page 157). The evaluation form has been updated for a higher degree of rigor in assessing habitat value, incorporates a step-wise scale to reduce scoring ambiguity, and is modified for use in GIS analyses. The modified habitat evaluation and scoring form for GIS and instructions for completing this form for each

assessment type are included as appendices to this document (**Appendix D** and **Appendix E**, respectively).

For scoring the values of specific habitat attributes, these assessments include aquatic and upland habitat within 200 feet of identified ditches, drains, channels, or swales. In its Programmatic Formal Consultation for U.S. Army Corps of Engineers 404 Permitted Projects with Relatively Small Effects on the Giant Garter Snake within Butte, Colusa, Glenn, Fresno, Merced, Sacramento, San Joaquin, Solano, Stanislaus, Sutter and Yolo Counties, California (USFWS 1997, 2004), the USFWS incorporated a standard of 200 feet of upland on each bank side of linear habitat as suitable upland for giant garter snakes when assessing a project's disturbance area. The 200-foot upland buffer has become standard in subsequent Biological Opinions and impacts analyses and is used as a set criterion in this assessment. Surveys were completed by roadway in reference to GIS-generated maps provided by Provost and Pritchard Consulting Group. Hand-held Global Position Satellite (GPS) units were used to collect geographic data for use in GIS analyses.

GIS analysis was completed using the program ArcGIS Version 9.2. Georectified orthographic aerial photos acquired through the National Agriculture Imagery Program (NAIP) were used as base templates to ensure the accurate depiction of habitat surveyed. GIS files delineating the Proposed Action alignment, provided by Provost and Pritchard Consulting Group, were used as a base to create an attribute table containing all ranking variables, with associated variables documented for each segment and tallied to provide a total habitat score. The symbol legend of these layers was then separated into three classes based on total score. This classification results in a series of maps of aquatic habitat with corresponding habitat values of individual segments distinguished by unique legend colors. Legend classes with corresponding point ranges are summarized in **Table 4**, below.

Table 4: Scoring value and range

Habitat Value	Point Range
Unsuitable	0-7
Marginal	8-13
Suitable	14-25

Classification values are based upon recognized habitat characteristics and personal experience and knowledge of giant garter snakes and their life history, distribution, and habitat requirements. Although point breaks within this valuation are based upon giant

garter snake habitat and ecological requirements, they are somewhat arbitrary in nature. The scores for each habitat feature provided within the database should be consulted when considering specific habitat types or trends. Habitat valuation categories are defined below.

Suitable habitat is characterized by all of the features necessary to support permanent populations of giant garter snakes, including: 1) sufficient water during the active summer season to supply cover and food such as small fish and amphibians; 2) emergent, herbaceous aquatic vegetation accompanied by vegetated banks to provide basking and foraging habitat; 3) bankside burrows, holes and crevices to provide short-term aestivation sites; 4) high ground or upland habitat above the annual high water mark to provide cover and refugia from floodwaters during the dormant winter season.

Marginal habitat is characterized by any combination of those features listed above needed to support transient giant garter snakes on a temporary basis, or to act as connective corridors between areas of more stable or desirable habitat. This habitat need only possess the water, vegetation, and refugia required to provide minimal coverage for dispersing snakes. On its own, marginal habitat is considered incapable of supporting permanent populations of giant garter snakes and is typically ephemeral, providing no permanent source of prey.

Unsuitable habitat is devoid of the water, vegetation, and refugia necessary to support giant garter snakes for a meaningful time. Such habitat is generally composed of large rivers, lakes, gunite drains, or temporary swales that possess no water during the active spring and summer seasons. As such, unsuitable habitat corridors are no more likely to support giant garter snakes than any non-aquatic environment, and if they do so, they do so only by chance. Transient features, such as shallow trenches and furrows intended only to direct winter runoff, typically do not persist through the remainder of the season, do not provide the aquatic habitat necessary to support giant garter snakes for a meaningful time, and should therefore be assigned to this category. However, because transient features may still exhibit characteristics such as winter water, bank sun, and bank or upland vegetation, they can accumulate the number of points necessary to qualify as marginal habitat in this evaluation scheme. Wetted features lacking any supporting characteristics are also deemed unsuitable if the distance or connectivity to suitable habitat is likely to preclude their use as migration corridors.

Assessment Results

Along the Proposed Action alignment, potential habitat consists of the amalgamation of ditches and drains constituting the regional water conveyance infrastructure. At the time of this analysis, approximately 100,931 linear feet of potential habitat were present along the Proposed Action alignment. Of this potential habitat, 81,411 feet (81 percent) were deemed suitable and 19,520 feet (19 percent) were deemed marginal. No features within the Proposed Action alignment were deemed unsuitable (**Figure 7, Plates 4.1 to 4.9**). Linear distances and relative proportions of habitat suitability classes along individual reaches of the Proposed Action alignment (see **Figure 2**) are summarized below in **Table 5**. A detailed summary of scoring results and feature attributes are included in **Appendix F**. Segment ID's presented in **Appendix F** are provided on **Plates 4.1 to 4.9**.

Table 5: Summary of habitat suitability within the Proposed Action alignment

Alignment Reach	Linear Distance in Feet (% of total)		
	Suitable	Marginal	Total
Upper Belding Lateral	29,650 (99.8)	59 (0.2)	29,709
Traynor Lateral	12,904 (73.8)	4,580 (26.2)	17,484
Rising River	763 (9.8)	6,986 (90.2)	7,749
Lower Belding Lateral	15,950 (83.6)	3,119 (16.4)	19,069
Schwind Lateral	9,130 (85.4)	1,556 (14.6)	10,686
Cassady Lateral	13,014 (80.2)	3,220 (19.8)	16,234
Alignment Total	81,411 (80.7)	19,520 (19.3)	100,931

Although all features along the Proposed Action alignment were classified as either suitable or marginal, general differences in habitat character were evident among individual reaches. For instance, although E-W sections of the Upper Belding Lateral lie adjacent to rice fields and exhibit other characteristics consistent with suitable giant garter snake habitat, gravel channel-bottoms and cementitious soils, which are typically inconsistent with occupied habitats, are more prevalent here than in other reaches of the alignment. On the other hand, the remainder of the Upper Belding Lateral lies adjacent to rice fields, and the silt channel-bottoms and clay-like soils observed in this reach are more typical of habitats occupied by giant garter snakes. Similarly, the Lower Belding and Schwind Laterals follow adjacent to rice fields for most of their lengths and

exhibit the same soil types and other favorable characteristics observed along the Upper Belding Lateral; the presence of adjacent perennial wetlands and/or ponds along certain segments of these reaches probably further enhance their habitat value. Although the northern half of the Traynor Lateral is largely surrounded by rice, most of the southern half lies adjacent to orchards and other incompatible land types, which likely reduces the relative quality of habitats along this portion of the reach. Likewise, although some eastern portions of the Cassady Lateral follow adjacent to incompatible land types and lack other favorable habitat characteristics, much of the western portion lies adjacent to either rice or perennial wetlands (especially within the boundaries of Gray Lodge Wildlife Area), which probably increases the habitat value along this portion of the reach. Finally, while the entire reach of the Rising River Lateral lies adjacent to rice fields, with the exception of the far western segment, bankside and upland vegetation along most of this reach is notably sparse.

Consistent with observations made during the field review conducted on March 29, 2009 by CH2MHILL (2009), much of the potential habitat along the Proposed Action alignment, including the features characterized as suitable in this assessment, is of relatively low- to moderate-quality due to the lack of adequate vegetative cover. Furthermore, the gravel and cementitious- soil substrates and relatively limited amount of freeboard (often ≤ 1 foot) observed throughout the alignment further limits the overall suitability of the features surveyed. However, given the general character of the surrounding landscape (predominantly rice agriculture) and the presence of numerous drains comprising relatively high-quality habitat adjacent to and/or intersecting the Proposed Action alignment, giant garter snakes are likely utilizing many or all features within the Proposed Action alignment to some extent.

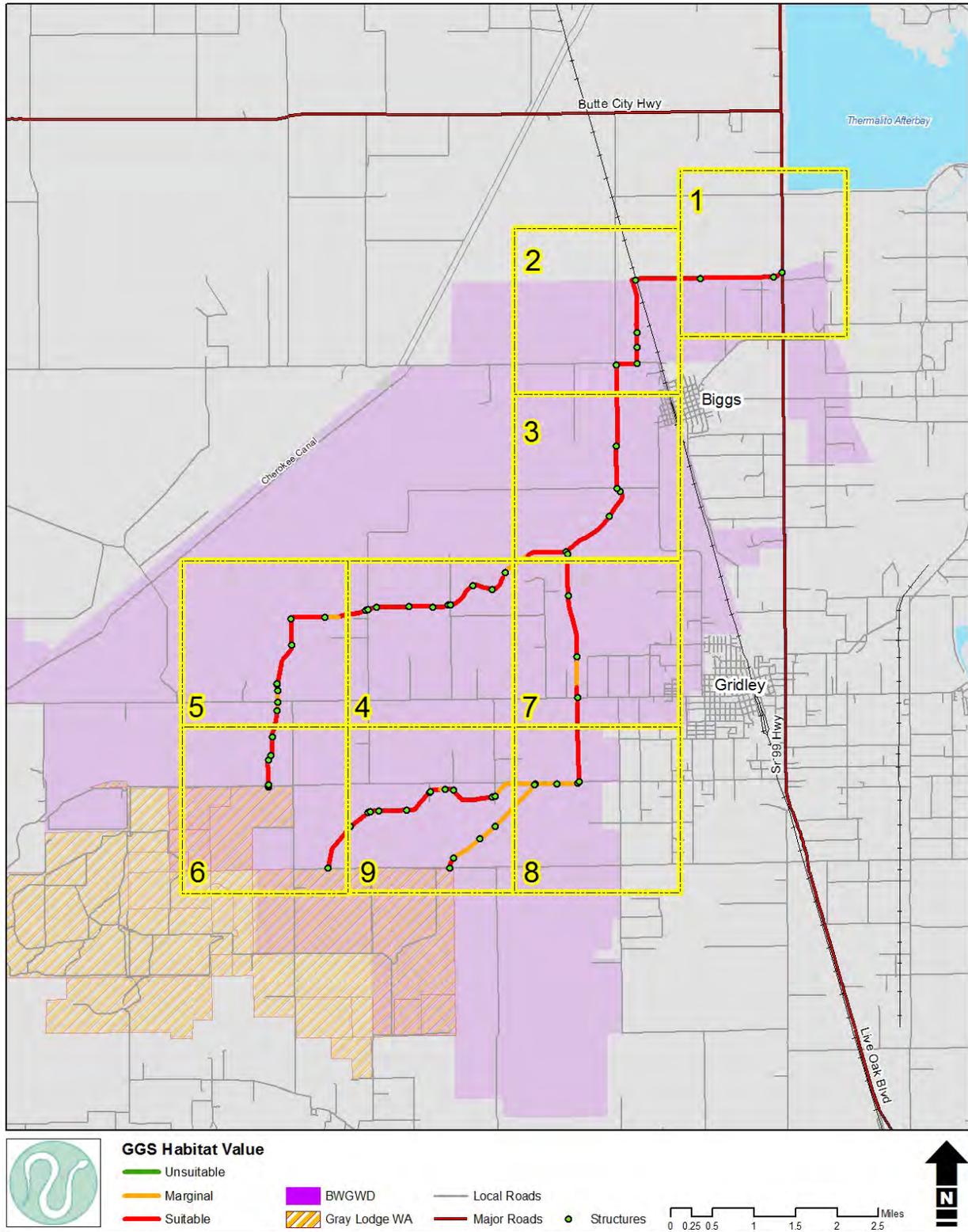
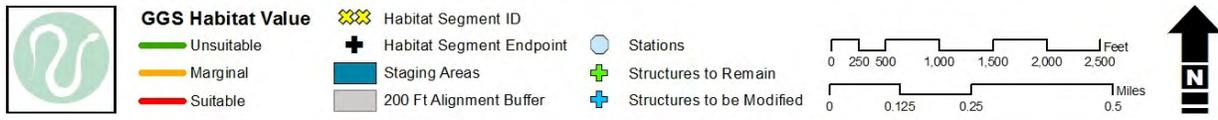


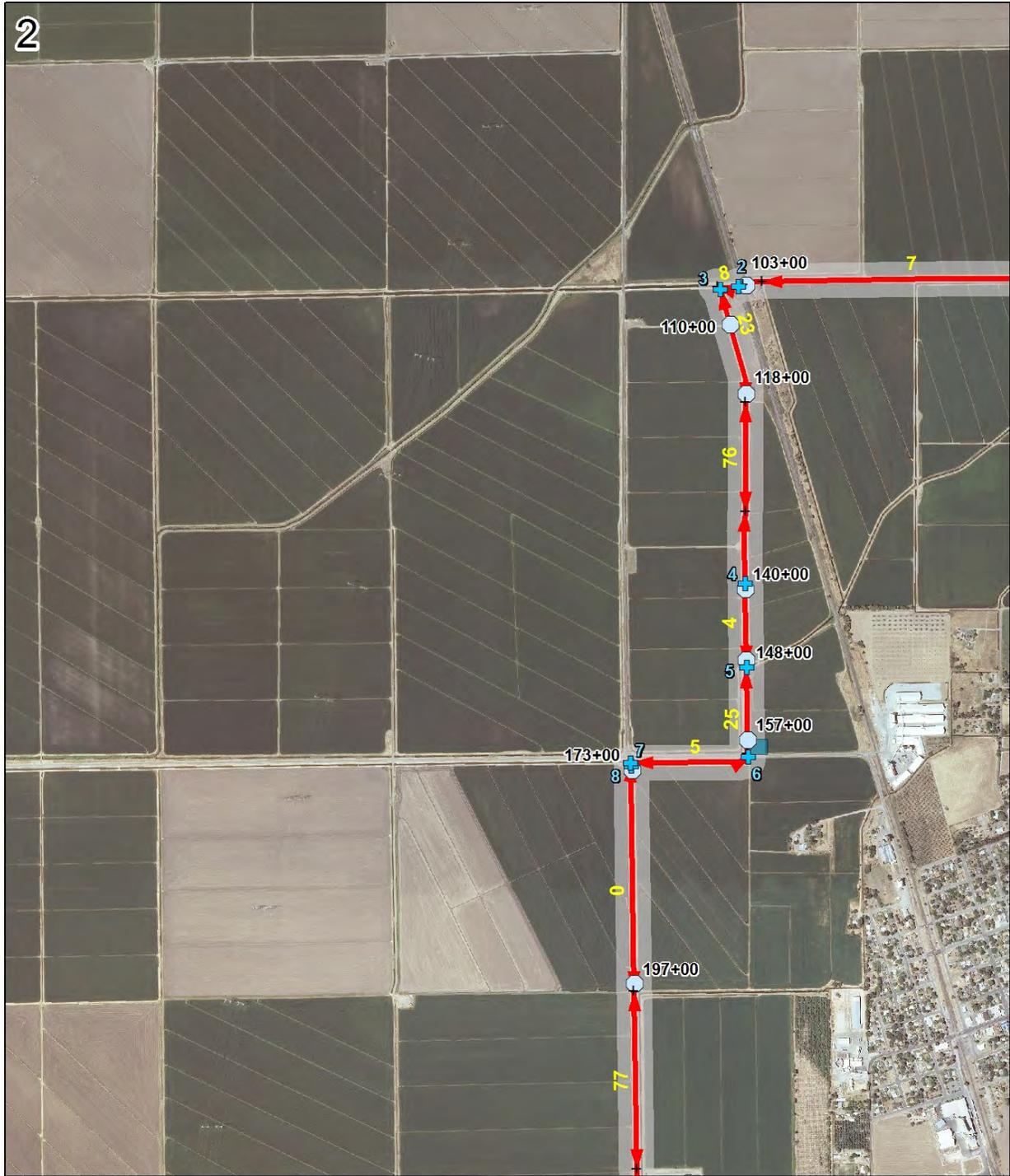
Figure 7. Overview of Proposed Action alignment, giant garter snake habitat suitability, and key to plates detailing suitability by section and reach (Plates 4.2 - 4.9)

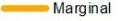
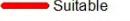


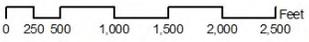
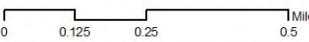
Sources: CNDDB 2011; Dahl Consultants, Inc.; DWR 2004; NAIP 2010; Provost and Pritchard Consulting Group

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Plate 4.1. Habitat Value and Structure Index



	GGS Habitat Value	 Habitat Segment ID	 Stations
	 Unsuitable	 Habitat Segment Endpoint	 Structures to Remain
	 Marginal	 Staging Areas	 Structures to be Modified
 Suitable	 200 Ft Alignment Buffer		



Sources: CNDDB 2011; Dahl Consultants, Inc.; DWR 2004; NAIP 2010; Provost and Pritchard Consulting Group

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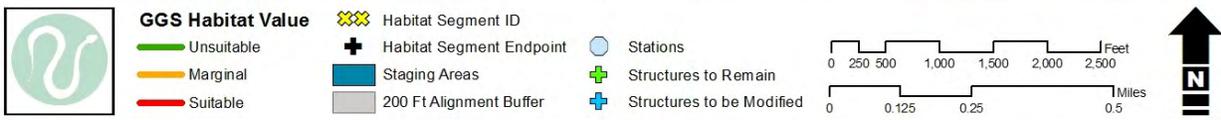
Plate 4.2. Habitat Value and Structure Index



Sources: CNDDB 2011; Dahl Consultants, Inc.; DWR 2004; NAIP 2010; Provost and Pritchard Consulting Group

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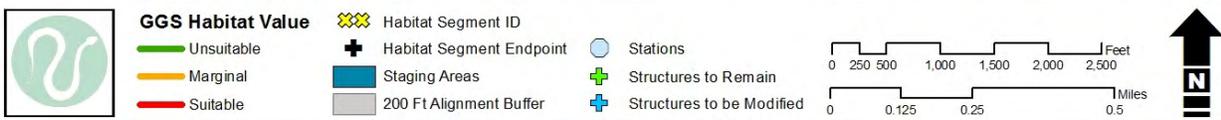
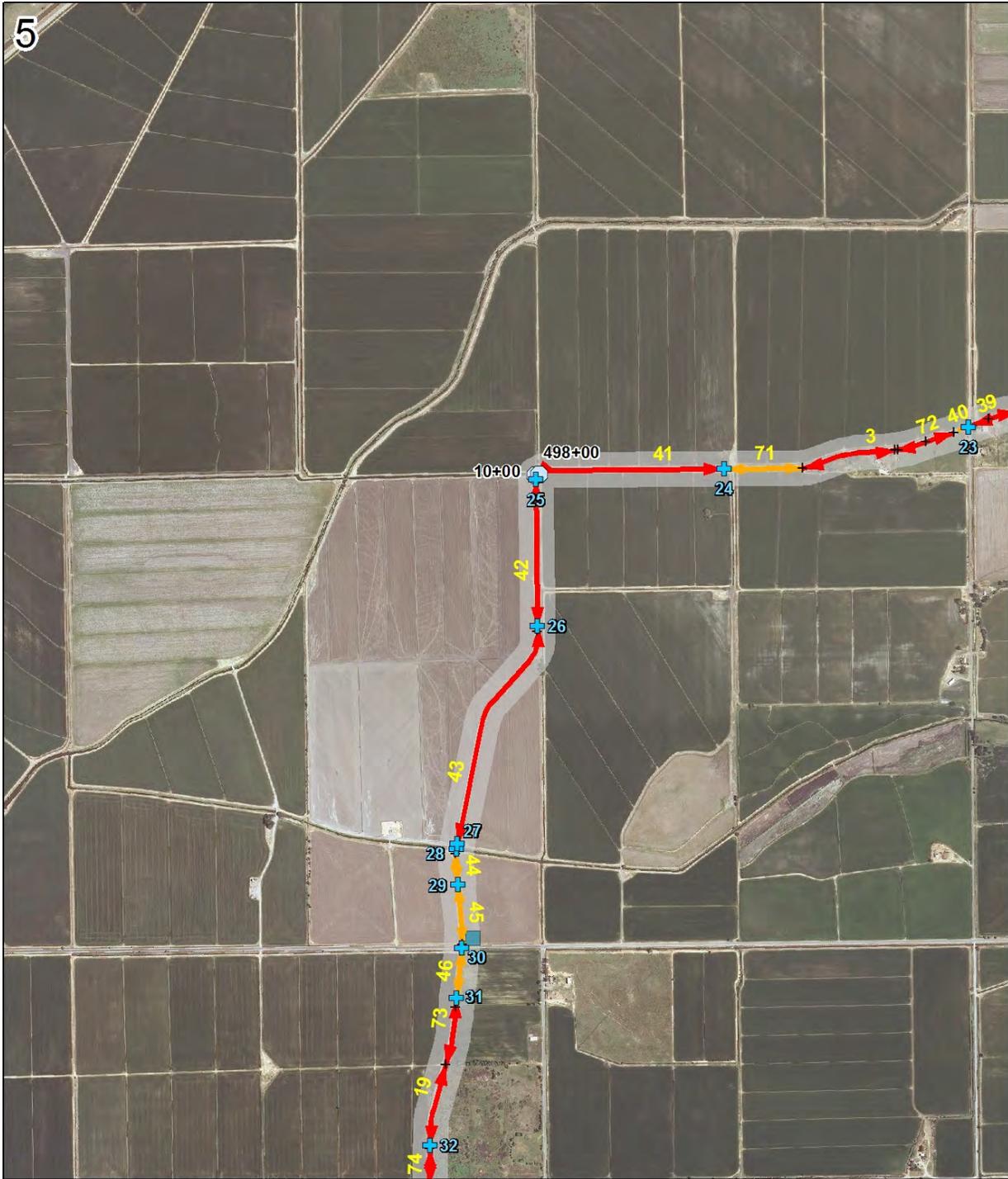
Plate 4.3. Habitat Value and Structure Index



Sources: CNDDDB 2011; Dahl Consultants, Inc.; DWR 2004; NAIP 2010; Provost and Pritchard Consulting Group

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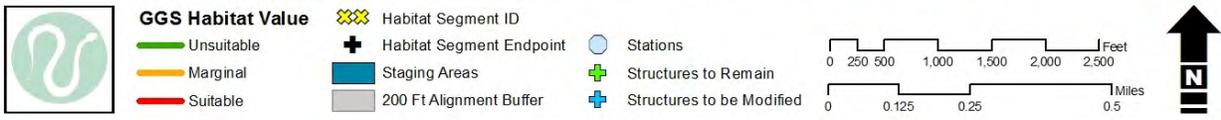
Plate 4.4. Habitat Value and Structure Index



Sources: CNDDB 2011; Dahl Consultants, Inc.; DWR 2004; NAIP 2010; Provost and Pritchard Consulting Group

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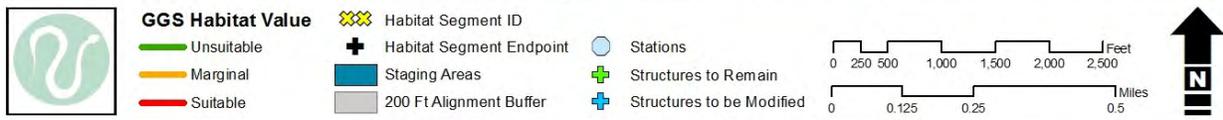
Plate 4.5. Habitat Value and Structure Index



Sources: CNDDB 2011; Dahl Consultants, Inc.; DWR 2004; NAIP 2010; Provost and Pritchard Consulting Group

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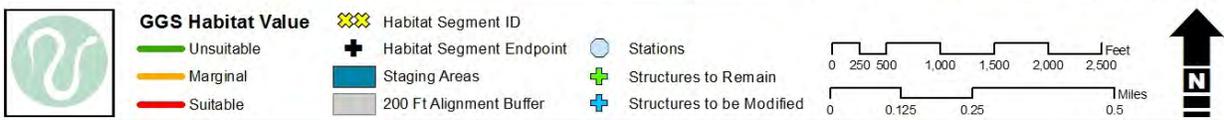
Plate 4.6. Habitat Value and Structure Index



Sources: CNDDDB 2011; Dahl Consultants, Inc.; DWR 2004; NAIP 2010; Provost and Pritchard Consulting Group

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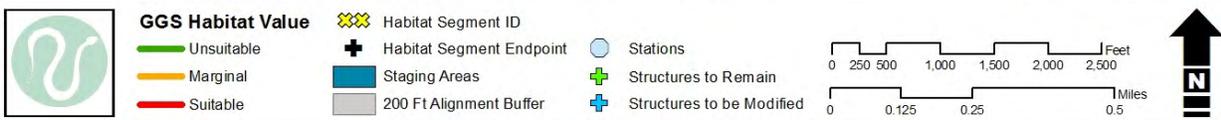
Plate 4.7. Habitat Value and Structure Index



Sources: CNDDB 2011; Dahl Consultants, Inc.; DWR 2004; NAIP 2010; Provost and Pritchard Consulting Group

Created January 9, 2012

Plate 4.8. Habitat Value and Structure Index



Sources: CNDDDB 2011; Dahl Consultants, Inc.; DWR 2004; NAIP 2010; Provost and Pritchard Consulting Group

Created January 9, 2012

Plate 4.9. Habitat Value and Structure Index

Proximity to Known Records

Giant garter snakes are documented in the project vicinity. A search of the California Natural Diversity Database (CNDDDB 2011) shows 13 giant garter snake records within a 5-mile radius of the Proposed Action alignment (**Table 6, Figure 8**), with at least one giant garter snake documented within or along the alignment itself (CNDDDB occurrence number 213). Eleven additional records fall within 5-10 miles of the Proposed Action alignment, the majority of which are situated to the northwest (**Figure 8**). Additionally, during an initial site assessment conducted in April 2011, Eric Hansen captured or positively identified four individual giant garter snakes at three separate locations along the alignment (see **Figure 8**) and observed several other garter snakes that were not identified to species. As well, surveys conducted by the CDFG in 2012 verified the presence of giant garter snakes at the Gray Lodge Wildlife Area, which is located adjacent to the Proposed Action area. This study yielded 12 occurrences of giant garter snakes in a relatively small portion of the wildlife area (Lorna Dobrovolny, pers. comm.).

Table 6: CNDDDB occurrence records within 5 miles of the Proposed Action alignment

Occ. No.	USGS 7.5' Topographic Quadrangle(s)	Township	Range	Section	County	Year Last Seen	Air Miles Distant
90	Pennington	17N	02E	20	Butte	1992	1.4
95	Sanborn Slough, Butte City	18N	01E	32	Butte, Colusa	1993	4.3
96	West of Biggs, Pennington	18N	01E	32	Butte	1993	3.5
103	Butte City, West of Biggs	10N	01E	29	Butte	1993	4.2
157	Biggs	18N	02E	03	Butte	1999	0.5
160	Pennington	18N	01E	33	Butte	2001	3.5
179	Pennington	17N	01E	12	Butte	1997	0.2
181	Sanborn Slough	17N	01E	20	Butte	2003	4.6
183	Pennington	17N	01E	02	Butte	2003	0.8
213	Biggs	----	----	----	Butte	1998	0.0
242	Gridley	17N	02E	10	Butte	1988	1.0
243	Pennington	17N	01E	03	Butte	1989	2.5
244	West of Biggs	18N	01E	15	Butte	1989	4.2

* Records shown in red are not included/shown in the commercial version of the CNDDDB

The presence of suitable habitat, proximity to known localities, and recent observations of snakes within the alignment itself suggest that giant garter snakes are likely to be encountered during project construction.

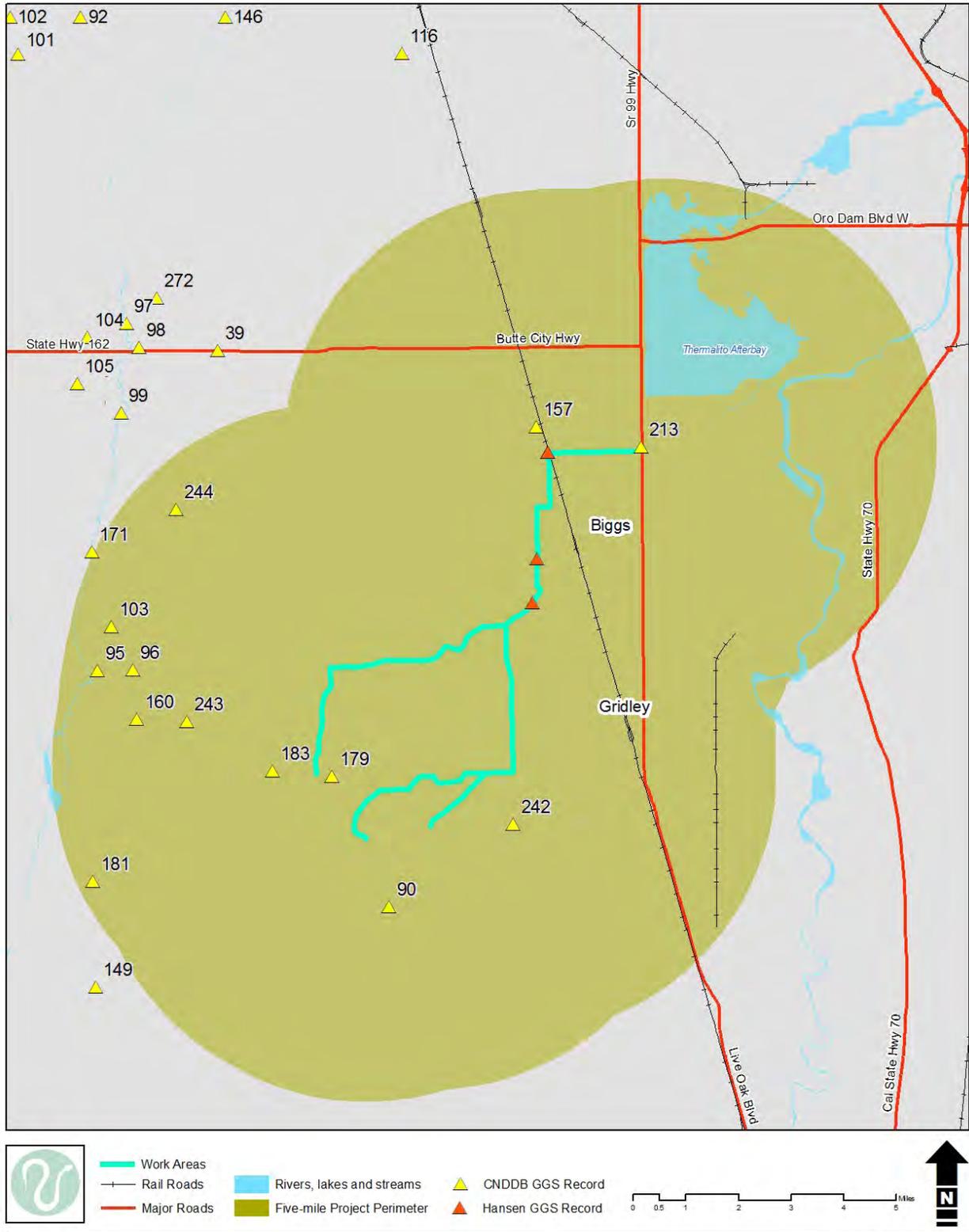


Figure 8. Giant garter snake occurrence records in the Proposed Action alignment vicinity

5. SUMMARY OF IMPACTS

Project construction would result in both temporary and permanent changes to upland and aquatic GGS habitats. The Proposed Action would result in a net permanent loss of 1.15 acres of GGS habitat (a loss of 1.32 acres of aquatic habitat, and a gain of 0.17 acres of upland habitat, once re-establishment occurs). It would also result in the temporary loss of a total of 48.22 acres of GGS habitat (24.31 acres of aquatic habitat and 23.91 acres of upland habitat).

Detailed descriptions of the methods and assumptions used to calculate impacts (provided by Dahl Consultants, Inc. and Provost and Pritchard Consulting Group) are provided in **Appendix H**. Detailed descriptions and accounting of impacts resulting from proposed Minor and Major Modifications are presented in **Appendix I and Appendix J**, respectively.

The Service Memorandum (Service file 81420-2009-TA-1164-1) specifies that the Proposed Action shall not exceed 22 acres (11 acres of aquatic and 11 acres of upland) and that the total cumulative amount of permanent giant garter snake habitat loss for all projects listed in Appendix A of the Opinion does not exceed 24.5 acres of upland habitat or 29.5 acres of aquatic habitat (the total acreage for all projects addressed by the Opinion). The total permanent impact acres associated with the Proposed Action are well within the limits expressed in the Opinion.

Minor Modifications

Minor Modifications are expected to impact only upland or terrestrial habitats. Temporary impacts from Minor Modifications are associated with structure excavation, demolition work, and structure backfill. Permanent impacts will result mainly from the two-foot increase in bank surface required to accommodate the increased delivery capacity, and represent a net gain in available upland. Minor modifications will result in a maximum 0.01 acre of permanent impacts and 0.03 acres of temporary impacts per each of 69 structures, generating 0.69 acres of permanent impacts (gain) and 2.07 acres of temporary impacts (loss) in total (**Table 7, Appendix I**). Most of the earthwork would be done during the irrigation season, while the structural work would be done during the winter shutdown.

Table 7: Summary of impact acreages by duration and habitat type

Alignment Reach or Feature	Permanent Impacts		Temporary Impacts	
	Upland Acreage	Aquatic Acreage	Upland Acreage	Aquatic Acreage
Minor Modifications				
Upper Belding	14 x +0.01 = +0.14	0	14 x -0.03 = -0.42	0
Lower Belding	11 x +0.01 = +0.11	0	11 x -0.03 = -0.33	0
Schwind	11 x +0.01 = +0.11	0	11 x -0.03 = -0.33	0
Traynor	14 x +0.01 = +0.14	0	14 x -0.03 = -0.42	0
Cassady	14 x +0.01 = +0.14	0	14 x -0.03 = -0.42	0
Rising River	5 x +0.01 = +0.05	0	5 x -0.03 = -0.15	0
Net Impacts	+0.69 (Gain)	0	-2.07 (Loss)	0
Major Modifications				
Upper Belding	+1.37	-4.04	-4.15	-5.72
Lower Belding	+1.75	2.40	-5.32	-2.99
Schwind	+1.00	0.65	-3.00	-0.68
Traynor	-4.75	1.75	-3.90	-4.63
Cassady	+0.10	-1.22	-4.53	-4.15
Rising River	+0.70	-0.86	-2.11	-2.67
Gross Impacts	+0.17	-1.32	-23.01	-20.84
Correction Factor¹	-(0.69)	-(0.00)	-(-2.07)	-(0.00)
Net Impacts	-0.52 (Loss)	-1.32 (Loss)	-20.94 (Loss)	-20.84 (Loss)
Staging Areas				
Staging Area 1	0	0	0	2.44
Staging Area 2	0	0	0.15	0.46
Staging Area 4	0	0	0.63	0
Staging Area 5	0	0	0.69	0.57
Net Impacts	0	0	-0.90 (Loss)	-3.47 (Loss)
All Modifications				
Total	+0.17 (Gain)	-1.32 (Loss)	-23.91 (Loss)	-24.31 (Loss)

¹ Because initial calculations of impacts resulting from Major Modifications include all features, upland impacts for Minor Modifications are subtracted from Major Modification impacts to eliminate double counting. Because aquatic impacts for Minor Modifications are included in the Major Modification totals, the correction factor for aquatic impacts is set to zero.

Major Modifications

Major Modifications would occur during the winter and spring season when the District's system is dewatered and accessible for construction within the canal prism (generally the end of January to the middle of April each year). Upland habitat loss and temporary disturbance associated with the 25 Major Modifications would occur on levee roads and on ingress/egress routes bordering the project alignment. The upland habitat along the majority of canal banks support ruderal vegetation that could provide cover for snakes,

and ground squirrel burrows, rip rap, and soil crevices that are suitable for occupation by snakes during winter dormancy and periods of brief aestivation during their spring and summer active season (e.g. - while thermoregulating or molting). Construction of the Major Modifications would result in a temporary disturbance to 20.94 acres of upland habitat and a permanent loss of 0.52 acres of upland habitat once re-establishment occurs (**Table 7, Appendix J**).

Aquatic habitat loss and temporary disturbance would occur along the drainage ditches and the rice fields abutting them. The existing ditches are primarily occupied by cattails (*Typha* sp.), which will be temporarily removed during project construction but will be replaced in-kind and allowed to re-establish since this drainage canal will not be maintained following construction. Adjacent crop land that is currently used for rice production would be removed to widen the canal, thereby converting aquatic rice field habitat to aquatic cattail marsh habitat. Although crop land that is currently used for rice production would be permanently reduced, this will be offset by the increase in water surface associated with widening the canals. The total amount of temporary disturbance to aquatic giant garter snake habitat for the canal widening, including staging areas, the temporary removal of cattail marsh and the conversion of rice field to cattail marsh, is 20.84 acres. The total amount of permanent loss of crop land that is currently used for rice production is 20.34 acres (**Table 7, Appendix J**). The total gain in water surface throughout the entirety of the canal system is 19.02 acres.

Construction of the Proposed Action would result in direct, adverse effects to all snakes inhabiting or otherwise utilizing the 1.15 acres of habitat to be permanently lost and the 48.22 acres of habitat to be temporarily lost. Construction would remove vegetative cover and basking sites, fill and crush burrows and crevices, decrease the availability of aquatic prey, obstruct snake movement, and significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. The permanent loss of 1.32 acres of aquatic habitat (rice land) will reduce the amount of foraging habitat available for snakes within the area. The Proposed Action could result in the disturbance and displacement of all snakes in the project area, and may result in the injury or mortality of snakes. Individual snakes may be killed during construction, particularly during the inactive season when they are occupying underground burrows or crevices and are more susceptible to direct effects, especially during excavation.

Construction of the Proposed Action may result in indirect, adverse effects to giant garter snakes through increased risks of road mortality associated with construction traffic. Work will not disrupt spring and summer water deliveries; therefore, no indirect effects (e.g. disruptions to normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering) that might result from reductions in local or regional

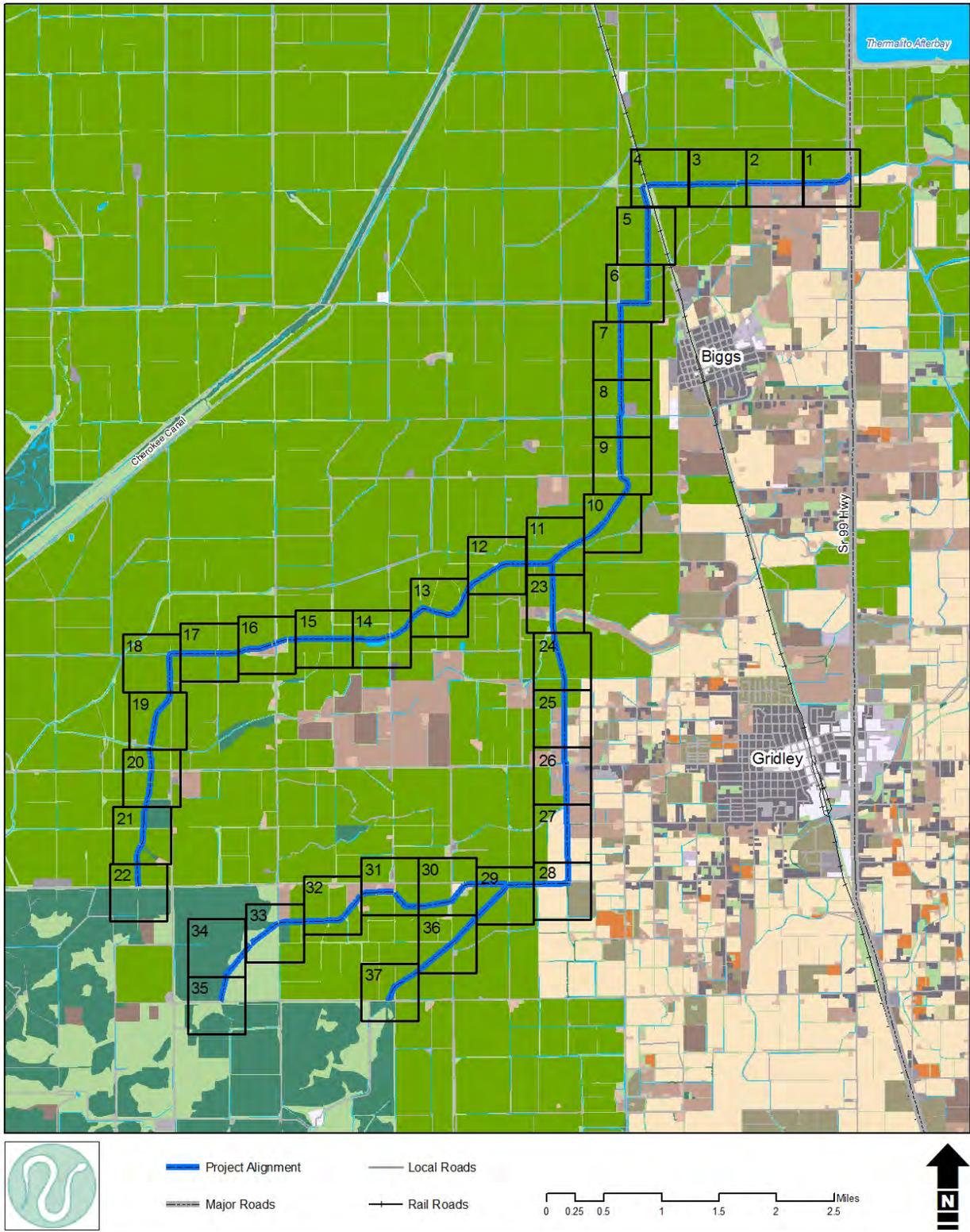
rice growing are expected to occur. No quantifiable, indirect impacts resulting from the Proposed Action are identified.

Staging Areas

Staging Areas Number 1, 2, and 5 (**Figures 3, 4, and 6**, respectively) are located within active rice fields, while Staging Area Number 4 (**Figure 5**) is confined to a weedy swath of fallow upland adjacent to an active rice field. Because all four Staging Areas are located either within active rice fields or in uplands adjacent to active rice fields, giant garter snakes and/or their habitat may be impacted. Impacts to aquatic and upland habitats within the staging areas would be temporary, as farm operations would resume and habitats would re-establish after construction is completed. The approximate acreage of aquatic and upland habitat at each Staging Area, based on GIS-based calculations made from location files provided by Provost and Pritchard Consulting Group, is provided in **Table 7**.

Land Cover

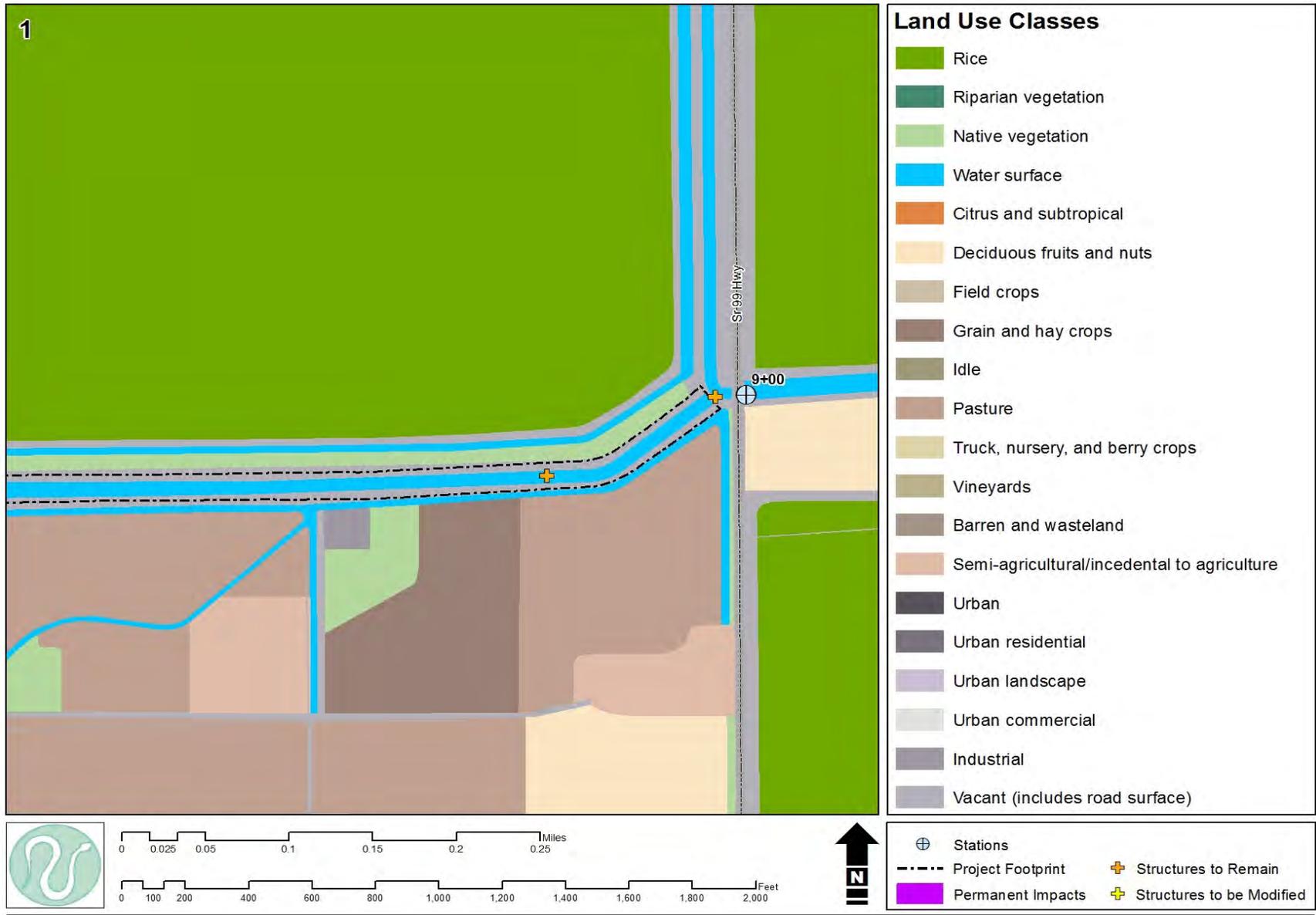
Section 1 of the Opinion's Implementing Procedure requires that Reclamation provide the Service with a 1"=20' site plan with an overlay showing habitat types at the site (open water, marsh, rice field, disturbed upland, etc.), and differentiating areas to be temporarily and permanently impacted. Based on direction provided by the Service and Reclamation in a meeting on December 6, 2011, a series of GIS-generated overlays depicting land cover with respect to the Proposed Action footprint is provided in lieu of a 1"=20' site plan due to the large number of plates that would be required at the 1"=20' scale. For this purpose, the 2004 (most recent) Butte County land cover data from the California Department of Water Resources California Land Use Survey was used to represent habitat type, and digital files depicting the Minor Modifications (structures), the Proposed Action footprint, reference stations (demarking Major Modification extent), and permanent impacts are provided as overlays in the resulting plates (**Figure 9, Plates 5.1 to 5.37**). Details on the actions proposed at each structure (Minor Modifications) and by station-station reach (Major Modifications) are provided in **Appendix I and Appendix J**, respectively.



Created 30 December 2011

Sources: DWR 2004

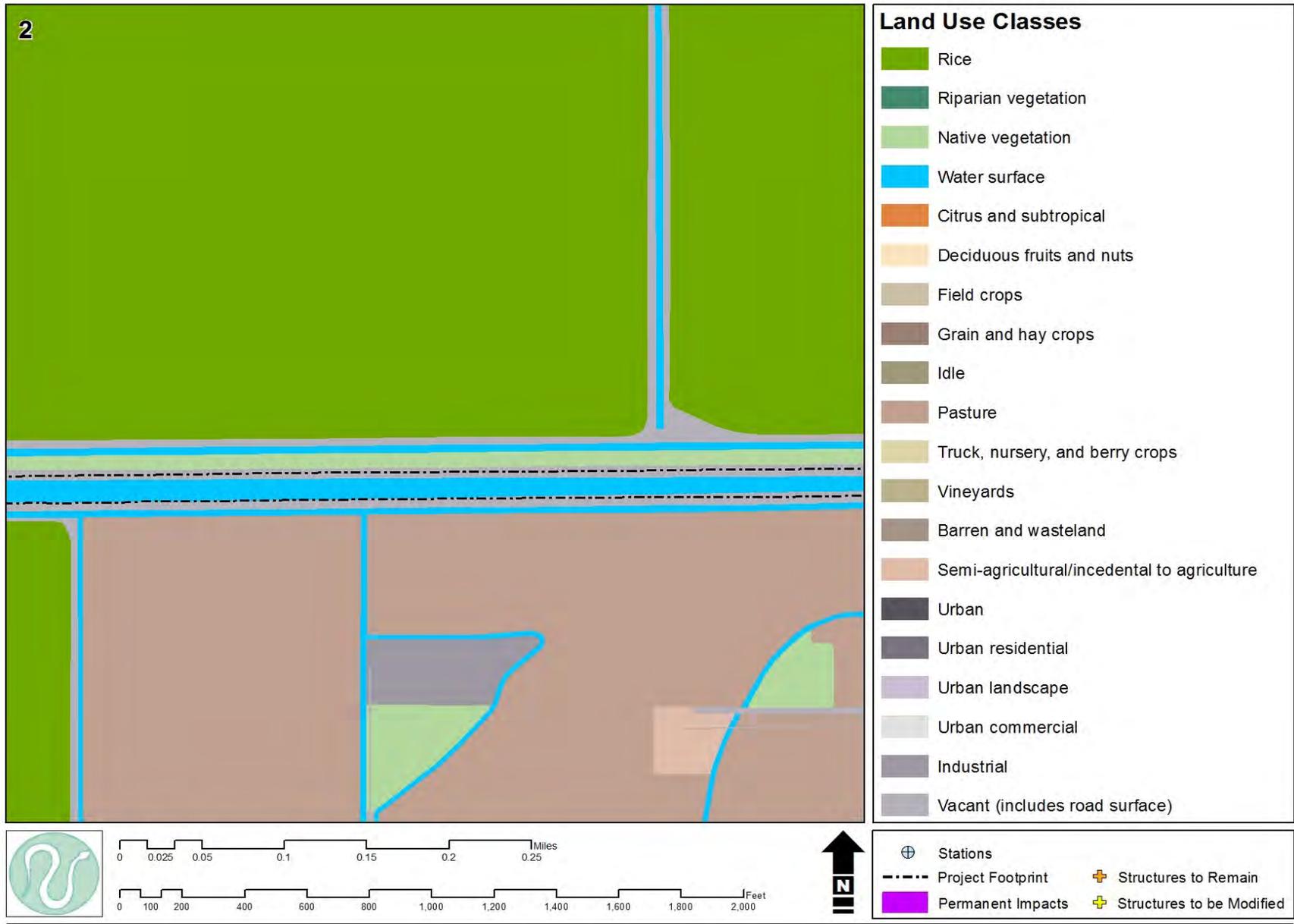
Figure 9. Land Use Cover and Key to Plates



Sources: CNDDDB 2011; Dahl Consultants, Inc.; DWR 2004; NAIP 2010; Provost and Pritchard Consulting Group

Created January 9, 2012

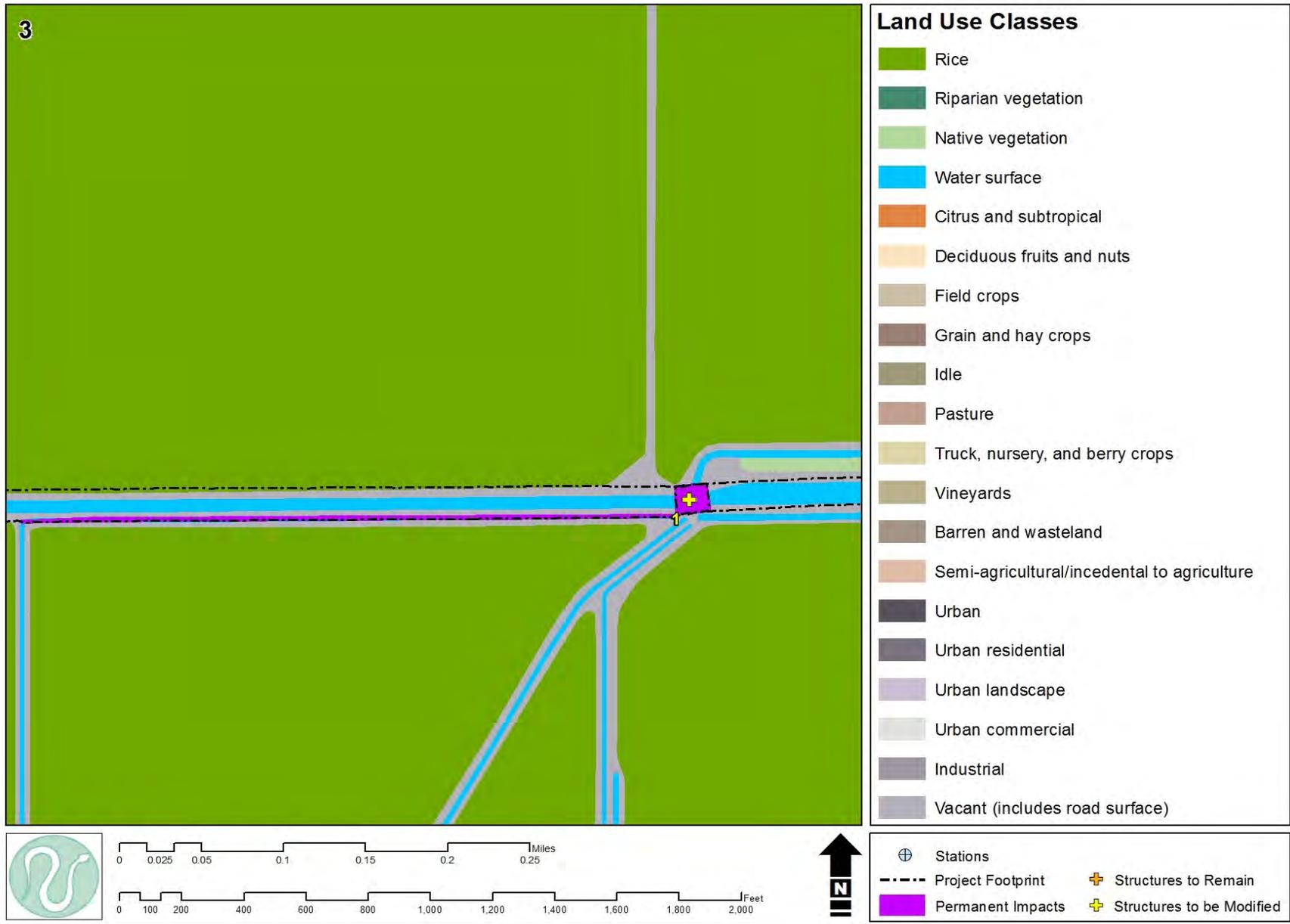
Figure 5.1. Land Use Cover and Proposed Action Features



Sources: CNDDDB 2011; Dahl Consultants, Inc.; DWR 2004; NAIP 2010; Provost and Pritchard Consulting Group

Created January 9, 2012

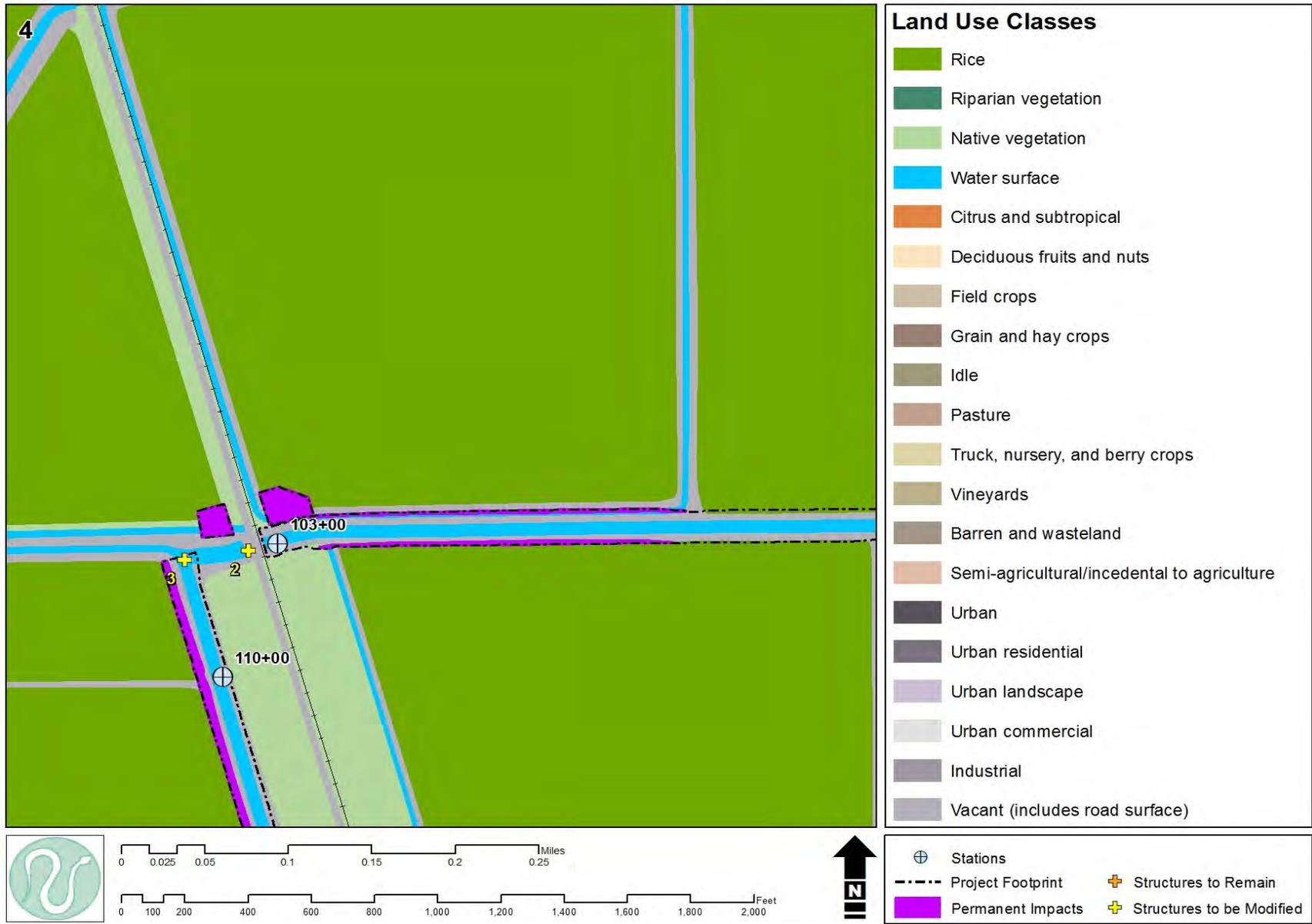
Figure 5.2. Land Use Cover and Proposed Action Features



Sources: CNDDDB 2011; Dahl Consultants, Inc.; DWR 2004; NAIP 2010; Provost and Pritchard Consulting Group

Created January 9, 2012

Figure 5.3. Land Use Cover and Proposed Action Features



Sources: CNDDDB 2011; Dahl Consultants, Inc.; DWR 2004; NAIP 2010; Provost and Pritchard Consulting Group

Created January 9, 2012

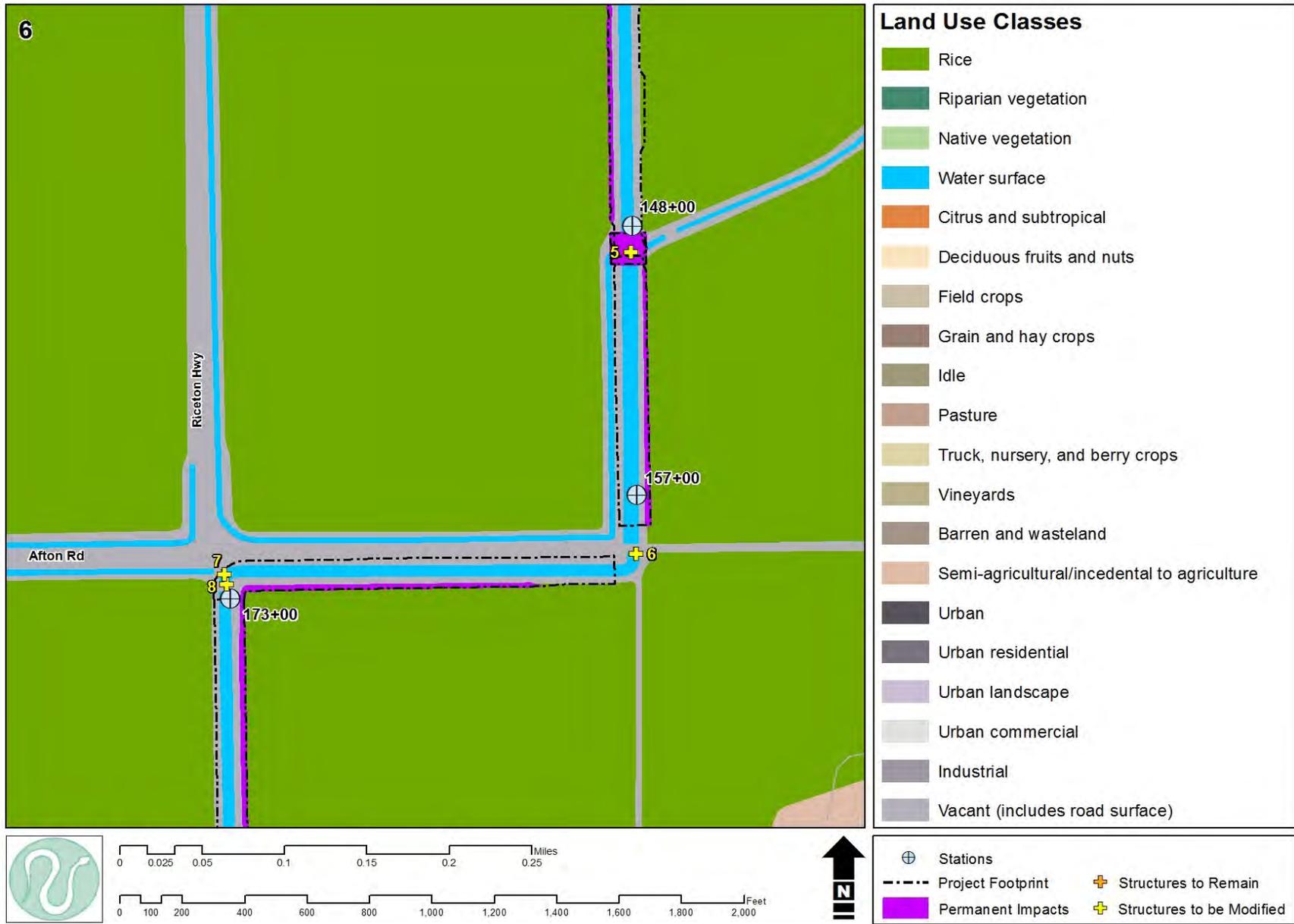
Figure 5.4. Land Use Cover and Proposed Action Features



Sources: CNDDDB 2011; Dahl Consultants, Inc.; DWR 2004; NAIP 2010; Provost and Pritchard Consulting Group

Created January 9, 2012

Figure 5.5. Land Use Cover and Proposed Action Features



Sources: CNDDDB 2011; Dahl Consultants, Inc.; DWR 2004; NAIP 2010; Provost and Pritchard Consulting Group

Created January 9, 2012

Figure 5.6. Land Use Cover and Proposed Action Features